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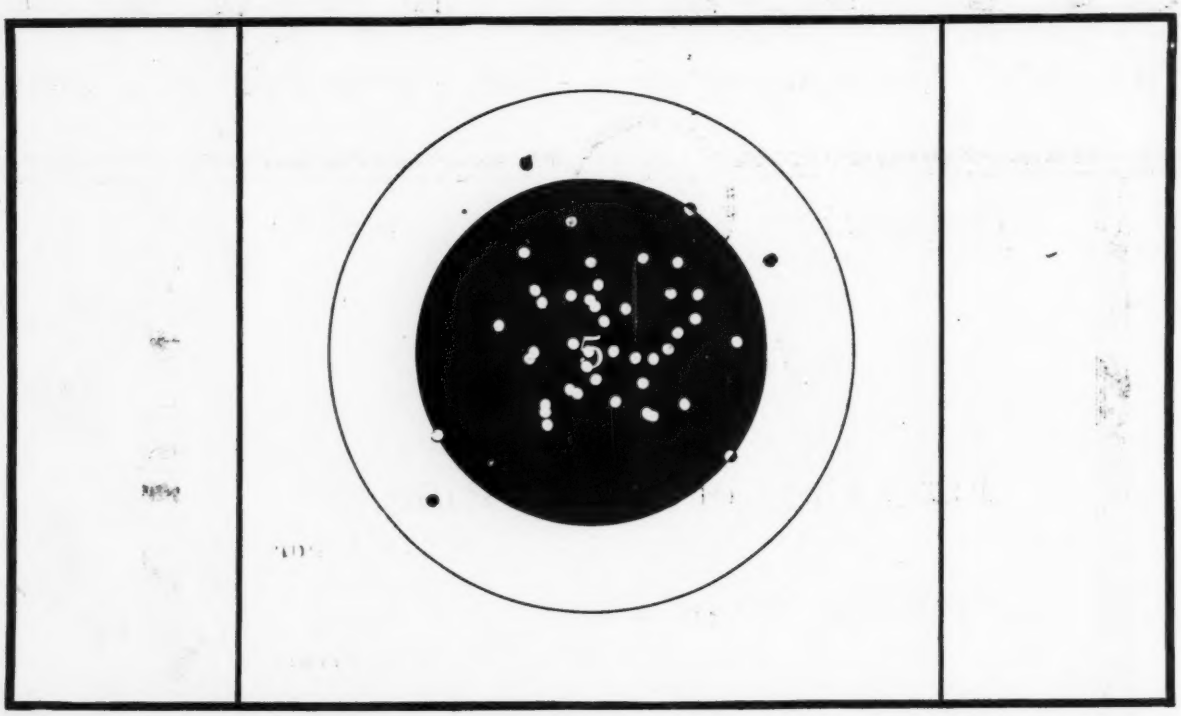

PALMA CARTRIDGES MAKE TARGETS LIKE THIS ONE POSSIBLE

Score of 222 x 225 over the PALMA Small Bore Course b y Mr. John W. Hession of the Manhattan Rifle and Revolver Club, New York City, in a club try-out shoot on June 17. Mr. Hession used a Pope-Ballard rifle, Fecker telescope and Remington PALMA .22 Long Rifle cartridges. The PALMA Course is 2 sighters and 15 shots for record at 150, 175 and 200 yards. The sighters have been omitted.

Here is an indication of the accuracy which may be expected from Remington .22 Long Rifle PALMA cartridges at the longer ranges. Through the courtesy of Mr. Hession, we present the target shown above. The deduction to be made from this excellent shooting is that .22 Long Rifle cartridges, capable of such close grouping at the long ranges, will produce correspondingly smaller groups at the shorter ranges.

The Remington PALMA cartridge is made to give a maximum of accuracy at all distances up to 200 yards, which is the accuracy limit of the .22 Long Rifle cartridge. If you are not shooting Remington PALMA cartridges in your rifle, you may be handicapping yourself. Perhaps your rifle will shoot the PALMA cartridge better than any other cartridge. Faith in your rifle and faith in your ammunition are necessary. You will soon learn whether you are a good rifle shot by shooting the PALMA Course—two sighters and 15 shots for record at 150, 175 and 200 yards, on C-5 target.

The present record is 224 out of 225. A score of 218 or better places you in the front rank of small bore shooters. Try the experiment and send us the results.

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EARLY DAYS OF THE FREE RIFLE

By C. S. Landis

FREE rifle shooting is staging a comeback in the United States. Of this there seems to be no question, and it will, no doubt, be a very welcome addition to many of the programs at our national and sectional rifle competitions.

As most free rifle events that have been held of late years have been at 300 meters and, in conjunction with or in preparation for the International Matches, the impression among the younger generation of shooters, and also among a good many others seems to be that free-rifle shooting is a foreign sport, and a new thing to American riflemen. This, however, is by no means true. Free-rifle shooting was one of our most popular forms of target shooting for a period of twenty or thirty years previous to 1910, and as an offhand rifle shot the American is by no means unknown.

The early-day free-rifle shot was the Schuetzen shooter, who was by no means always the disreputable beer barrel that he is sometimes painted. There may have been cases where beer was used or even sold in the immediate neighborhood of Schuetzen Fest's (merely another name for shooting festivals, or matches) but we must remember that Schuetzen shooting was most popular between 1880 and 1910, a period when the public use of alcoholic liquors (including beer) in the United States, was by no means unknown or unusual.

The .32-40 single-shot rifle which in every respect is a free rifle and a splendid one for its purpose was the most popular weapon for 200-yard Schuetzen shooting. In addition, the .38-55, .33-40 (usually made by reboring a .32-40), .28-30, some .40's, the .30-40 Krag, a few early Springfields, and a motley collection of all kinds and calibers of hunting rifles were used—even at the national Schuetzen Fest's. The military and hunting rifles were used with an added handicap of one point per shot to give them approximately an equal show.

The vast majority of these rifles, including the special single-shot target rifles, were not muzzle loaders. Most of the special muzzle loaders were fitted with .32-40, .33-40 or .38-55 barrels cut by Pope, Schoyen, Zischang, and other well known makers, while the standard single-shots were the Ballard (Union Hill), Remington-Hepburn, Winchester, and Stevens Ideals No. 45, 49, 52, and 54.

The single-shot target rifles were nearly all fitted with globe and peep sights, the front sight being either an aperture or a pinhead, or both, used interchangeably. Double (or Schuetzen) set-triggers were usually attached, because they did much to increase the accuracy of offhand shooting, enabling the marksman to obtain a smoother, and, when desirable, a lighter, trigger pull. The rifle could always be used as a regular single-trigger rifle, even though fitted with a set trigger; and those who bought such rifles and paid the $4.80 extra for this feature did so only because it improved their shooting. I have owned three target rifles fitted with set triggers, and in twenty years have yet to see their impracticability or lack of safety, for all kinds of target shooting—or for small game hunting.

Two consecutive 10-shot groups from rest at 200 yards by Miss Minnie Schenck of Williamsport, Pa. Circles—1.41 inches in diameter.

These targets as shown were both shot at 200 yards, with the aforesaid rifle. Each target would count 120 if shot on the Standard rest target. The two groups were made in succession. Miss Schenck is a protege of John D. Kelley, of Williamsport. Mr. Kelley remarks that it took him thirty years of practice before he could record such a score.

This shooting was done from a Pope rest with bullets lubricated with Leopold lubricant and Leopold sheet lubricant used over the powder instead of blotting paper, which riflemen generally use. The skill shown by Miss Schenck is evidence that women are capable of doing the finest work with the rifle.

Most of the offhand shooting in those days was at club or sectional shoots. The principal clubs were at Walnut Hill, Mass., Schuetzen Park, Greenville, N. J.; Glendale Park, Glendale, L. I., N. Y.; Union Hill (near Hoboken) N. J.; Schuetzen Park, Philadelphia, Pa.; Shell Mound at San Francisco; and others at St. Louis, Mo.; Charleston, S. C., and Chicago.

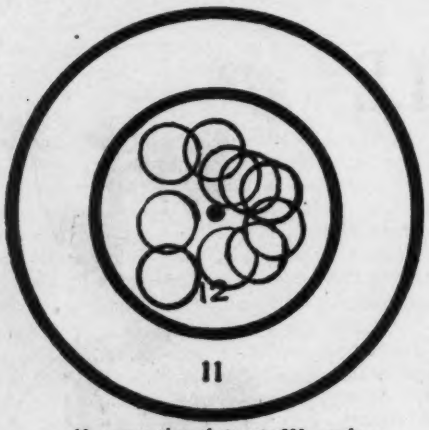
About every three years a national shoot or Schuetzen Fest was held at one of these clubs. It would last one week. Over five hundred riflemen usually attended—at their own expense—and shot through all or part of the program.

The first of these shoots was held just outside of Brooklyn—at Glendale Park, Glendale, Long Island, in 1895. It was attended by six hundred shooters and during the latter part of the week, 30,000 visitors were on the range in one day.

From $1,000.00 to $1,500.00 in cash, in addition to merchandise prizes, were distributed in each match.

Shooters attended from as far west as San Francisco and Portland, Oregon, and there is no reason to believe that our present day National Matches were much more attractive than these old time competitions.

All of the shooting at the big Fests was at 200 yards, and as on the local ranges, was offhand. Probably 90 per cent. of it was on the German Ring target, or one of its modifications. The German Ring, which is very similar in appearance to our present International target, was used not because it happened to have a German name, but because it was the best target available for the purpose. It contained a 12 inch black aiming bullseye



10 consecutive shots at 200 yards, machine rest by John D. Kelley, Williamsport, Pa., May 19, 1904.

in which were rings spaced three-fourths of an inch apart. The central ring was 1½ inches in diameter and counted 25. The 24 ring was 3 inches in diameter; the 23 ring 4½ inches; the 22 ring 6 inches; and the 21 ring 7½ inches, etc. A ten-shot possible score was 250; the American record for many years was 240; while 220 was a good score.

Many thousands of dollars were given as prizes at these national shoots. In the Honor Match, consisting of three shots on the ring targets at 200 yards, the first prize was nearly always $500.00 in gold; the second $300.00, and so on down. Even tenth place would pay about $100.00 in cash. As this would be equal to about $1,500.00 in gold, at present values, for the winner of the Wimbleton Cup Match, it is obvious that no bar was needed at the firing line to obtain sufficient shooters.

In addition to cash, there were also many thousands of dollars worth of silverware and other merchandise prizes, most of which were donated by the clubs belonging to the National Shooting Association.

The entrance fee in the Honor Match was $7.50—no re-entries. The shooter was guaranteed a prize at least in value to his entrance fee.

There were also plenty of re-entry matches at $1.00 per ten shots. The prizes were in cash and the high men often won a good deal of money.

In the Stitch Match the man who shot closest to the exact centre of the target (not the German Ring) was the winner. First prize in this match was usually $200.00.

A good many people have the idea that the Schuetzen shooter took a half hour to aim each shot and another hour or so to reload his muzzle loading rifle and that he shot about ten shots a day. Actual facts, however, were quite different.

The usual program was to shoot about one hundred shots per man in an afternoon. On several occasions 200-shot record scores were fired in less than four hours. And this incidentally is more than enough for most military shots who have shot long enough to learn the error of over-shooting.

It was customary for five or even ten shooters to fire turn about from one shooting booth. As soon as a man fired a shot and had it marked he gave way to the next shooter. Spotting telescopes were not very common and it was customary to mark the location of the bullet hole from the pit by placing the point of an arrow at the hole. If the bullet struck in the black, the white side of the arrow was turned toward the shooter. If

25 consecutive shots at 200 yards with a No. 54 Stevens rifle, 32-40, 30-inch barrel.

outside, the black side of the arrow faced the firing line. In this way things moved along quite rapidly, everyone had plenty of chance to load and rest between shots, and it was seldom that anyone had a chance to "hog" the range.

Most Schuetzen rifles weighed between eleven and fourteen pounds with an average of about twelve pounds. This is just the weight of the 24-inch barrelled heavy Springfield free rifle. Many of the stocks were made to fit the individual, and the butt plates were designed for steady holding in the offhand position. The rifle actions were invariably fast, easy to load or clean, and the weapons well designed and beautifully finished. And they cost from $48.00 to $80.00 apiece. In comparison our present heavy-barrelled Springfield rifle looks rather crude and poorly finished, and it has very much slower lock speed, but no doubt these details will all be improved upon when the shooters demand it.

The accuracy at 200 yards of the best breech and muzzle loading Schuetzen rifles of those days was very fine.

The following quotations and the cuts shown with this article from "Shooting and Fishing" of 1900 to 1904 will give a good idea of how accurate they actually were.

"Mr. F. C. Ross, shooting a .32-40 Stevens-Pope rifle fired 130 consecutive shots from machine rest at 200 yards. *All* of the shots were in or on a 3-inch circle, and all but one of them were in a 2¼ inch circle." (Shot 1902)

"He (Dr. W. G. Hudson) was equipped with two rifles which had given equally good results from the machine rest at Greenville, N. J. One was a .32-40-180 Pope-Ballard, and the other a .33-40-220 Remington Schuetzen. The .33-40-220 Stevens-Pope barrel with which the doctor made his remarkable record of 2301 x 2500 on November 3, 1903, has of late been not quite up to its former standard, and has been replaced in his Ballard action by a .32 Stevens-Pope barrel with a comparatively slow twist adapted to the 180 grain bullet."

On Saturday, June 11, 1904, a careful test was made from machine rest, alternate groups being shot from this weapon and also a .33-40 Remington Schuetzen, just arrived from the factory, and in which he used a 220 grain Pope bullet. Groups measuring about 2 inches (at 200 yards) were secured from *both* rifles. (Dr. Hudson used breech-loading rifles, the muzzle velocity of the bullets being probably about 1400 feet per second.)

In New England and several other localities in the East the standard American target was very frequently used for offhand shooting.

100 consecutive shots, off-hand, at 200 yards by H. M. Pope—a world's record score of 917. Every shot in the 11-inch black.

The 10 ring of the standard American is 3.36 inches in diameter, the 8 ring 8 inches, and the 7 ring 11 inches. At first the aiming bullseye was 8 inches but later the 7 ring was also blacked in giving an 11 inch aiming mark.

In addition to the offhand shooting, considerable muzzle rest shooting was done at Walnut Hill, Mass., and other places, but *not* at the national competitions. As the 3-1/3 inch ten ring was too easy to score possibles on at 200 yards, when shooting from rest, 11 and 12 rings were placed inside the 10 rings. The 12 ring was only 1.41 inches in diameter. Even so, no less than six (6) ten shot possible scores were actually made in this 12 ring on the Walnut Hill range alone, between June

(Continued on page 20)

SPOTTING SCOPE DOPE

By J. W. Fecker

A NECESSARY part of every shooter's equipment for short and long range target work is an observing telescope of some kind to enable him to spot his shots in the target. The necessary size and power of this telescope is determined by the size of bullet holes and the distance at which he expects to see them.

In discussing the observing telescope, it will be well to consider first its construction; secondly, what effect each part has upon the quality of the image, and lastly, what determines the proper size and magnification of the telescope to enable one to see a given size bullet hole at a given distance.

The telescopes may be divided into two classes, those having a system of lenses for erecting the image and those having prisms for erecting the image.

The type most usually seen is the telescope with a lens erecting system and they are usually constructed in the manner shown in figures 1, 2, 3 and .4

The lens Q is the objective which forms an inverted image at the focus Fl. This image is taken up by the erecting system E R and projected to F2 where it is right side up and enlarged. It is then further enlarged by the eye-piece E P. In the very cheapest glasses, the erecting lenses and eye-piece lenses are all alike and are made of ordinary window glass, and the field is small and indistinct, a blue haze appearing over the field.

In the better grade of these telescopes, the two erecting lenses are not alike and have different curves on either side in order to obtain a larger and flatter field. The eye-piece lenses are likewise of different curvature and focus. Such a scope is illustrated in Fig 2.

The highest grade draw telescopes are constructed with an achromatic inverting lens, and achromatic eye-piece, as shown in Fig. 3. In this type of telescope the field is large, and the image is clearly and distinctly defined over the entire field, and the image is crisp and full of contrast.

The second type is the prismatic type, usually of the Porro prism type, which is clearly shown in Fig. 4. The purpose of the prisms is to erect the image, and they also are of valuable assistance in securing a much better optical correction over a larger field than is possible with a lens erecting system. They also possess the added advantage that they shorten the entire instrument from about 25 per cent. to 33 per cent., giving a more compact and lighter instrument.

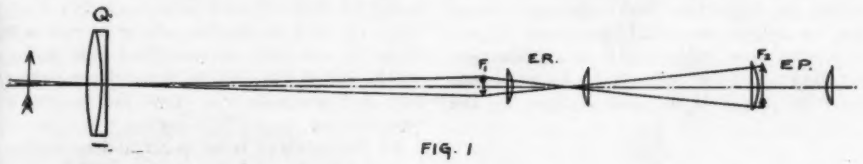


FIG. 1

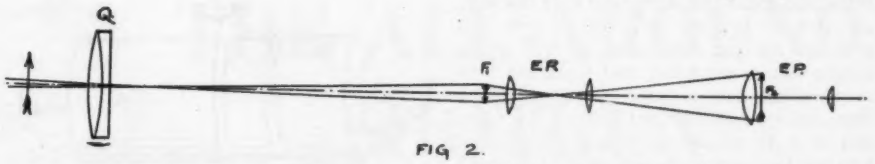


FIG 2.

FIG. 3

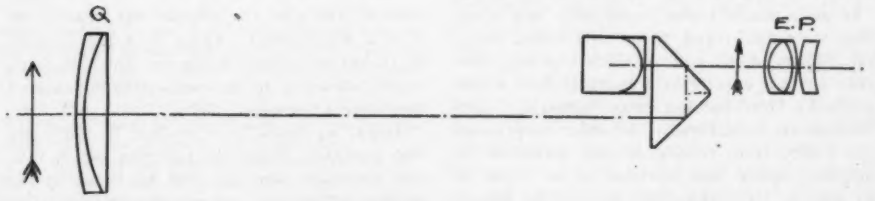


FIG. 4

From the wave theory of light, it can be shown that light in passing through any aperture is bent at the margin of the aperture and forms a series of light and dark bands which are called diffraction fringes. The shape of these fringes is determined by the shape of the aperture and are circular for a circular aperture. We may consider the object glass of any telescope as a circular aperture which forms a series of diffraction rings at the focus of the objective. Thus, the image of any distant point is not formed as a point but as a series of very minute diffraction rings. If, now, we consider two points very close together, their images will be two series of diffraction rings very close together, and if they are so close together that the rings overlap, it will be impossible for the eye-piece to show them as two separate images. The smallest possible angular distance at which these images can be distinctly formed as two separate images is called the resolving power of the objective, and is always expressed in angular measure. Thus, no matter how much the eye-piece magnifies these images, they will not appear as two images if the objective can not form two separate images.

As the diameter of these small diffraction rings is dependent upon the diameter of the circular aperture of the objective being larger for a small objective, and smaller for a large objective, it readily can be seen that with a large objective, due to the rings being smaller, the images can be closer together, and the resolving power will be higher. It is clear then that the ability to separate very close images is entirely dependent upon the diameter of the objective, and not upon its focal length, or the magnification.

Applying this principle to the spotting telescope, we may asume that the opposite sides of a bullet hole form two images very close together. If the angular value of the bullet hole is within the resolving power of the objective, it will form an image of each point on each side of the bullet hole, and give a perfect image of the bullet hole, which can be seen with the proper eye-piece. If the angular value of the bullet hole is not within

(Continued on page 19)

BULLETS AND TOPS

By Maj. J. S. Hatcher

WHEN an engineer who has had very little to do with fire-arms in a practical way begins to design bullets, his productions usually look like just about the opposite of what a man of more experience in this line would make. The beginner wants to get the weight well forward, so that the light part can tail out behind and steer, so to speak. He designs his bullet in the general shape of an airplane bomb. Now anyone who has worked on this line soon finds that the more of the weight is behind and the less is in front, the better in general the bullet is. This was illustrated very well by a bullet that I once saw made in the shape illustrated in figure 1. It was intended to fly with the blunt point first, and when it was shot the designer was surprised to find that he could not hit the chronograph target with it at 100 feet; but when he turned it sharp end first,

Figure 1

it made very good targets at 500 yards. The reason for this is the fact that the modern bullet is a top. This designer would not have expected an ordinary peg top to spin well with the big end down; but he was asking exactly this of his bullet shot blunt end first.

Of course, bullets have not always been tops; not even all the rifled bullets. Everyone that is at all acquainted with the history of firearms knows that the first rifles used round balls; but a great many people who never studied the subject are very much surprised to find that this is so. They think that the reason for rifling is to enable the use of a heavier bullet in a smaller bore by holding an oblong bullet end-on. As applied to modern arms, this is so, but rifling was first invented and used for a very different purpose. The early muskets shot round balls, and when they were discharged, these balls rolled along the bottom of the gun, or along one side, and then curved, exactly as a baseball does when pitched. This curving was naturally very detrimental to accuracy. In order to prevent the bullet from rolling in one direction or another, rifling was introducted to cause it to spin on its longitudinal axis. This device had the desired effect of greatly increasing the accuracy of the weapons of that day. Later, when a heavier bullet was desired, the increase in weight was obtained by making the bullet oblong and depending on the rifling to keep it point first. It was at this point that the bullet designer began actively to encounter the principle of the top. Many of the earlier oblong bullets were very faulty in design, being made, as has already been mentioned, in the shape of an airplane bomb, with a long tail behind. Others were (and in the case of revolvers, still are) made with a solid point and hollow base. However, among the most accurate bullets have been some that were heavy behind, and especially light in front. An example is the notorious "Dum Dum" or Mark IV of the British, which had a hollow point. The ballistics of this bullet were particularly good. Other British bullets have had a plug of paper or aluminum inside the jacket at the point, to throw the center of gravity back. This lightening of the point corresponds in effect to fitting a long peg to a top.

There are many ways in which the behavior of tops and other spinning bodies are apparently contradictory, and these are all of importance to the bullet designer, as the modern bullet is essentially a spinning body and is governed by the same laws. Some of the most interesting phenomena that may be observed in connection with spinning objects may be briefly described. Everyone knows, of course, how impossible it is to balance a top even for a few seconds on its point and yet how easy it is to make it stand on the

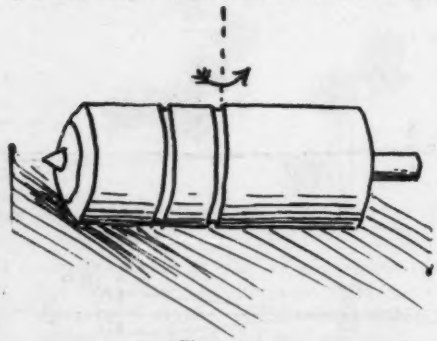


Figure 2
Tin top full

point when it is spinning. Because of long familiarity with this fact it seems perfectly natural, yet who can explain the reason for it in a few words? Again, if a top is spun at an angle to the surface on which it rests, it will soon rise to the vertical in defiance of the force of gravity. Why?

Again, we know that friction is the force that gradually brings the spinning top to rest, and we might suppose that by reducing the friction at the point, we could greatly prolong the spin. The fact is, that many tops refuse utterly to spin on a smooth surface such as polished glass, but fall down and turn round and round on the shorter axis. Further, suppose that we have a hollow tin top which spins fairly well. It might be thought that increasing the weight of the top by filling it with water would improve its stability. The practical result of such an experiment is usually the opposite. The chances are that the top full of water when spun will lie down and turn round on its short axis. The result of this experiment cannot always be stated with certainty in advance; it depends somewhat on the shape of the top. Some shapes will spin feebly when filled, but the filling is almost always a distinct disadvantage. A raw egg behaves like the top full of water. It is almost impossible to make it spin on the end, for it will lie down and turn around the short axis. But a hard-boiled egg, if spun on the side, will jump up on the small end and continue spinning for some time. This effect is best seen on a rough surface, which seems to aid the egg in getting upright. The same effect is sometimes seen when acorns are lying on the ground. If several are kicked violently they will usually skid along for a little distance and then rise on their sharp ends and remain spinning for a while. Another apparent contradiction is observed in the case of a sphere with one part loaded; as for instance, a wooden ball into one side of which a small lump of lead is inserted. Such a ball will come to rest with the weighted part downwards, but if the ball is spun, the weighter part will gradually rise until the weight is near the top.

All these things seem queer and contradictory at first glance, but there is something else about the behavior of tops that seems just as queer, and is perhaps even more important in its connection with the properties of bullets. This is the fact if the axle of a spinning top is pushed, it moves, not at first in the direction of the push, but at right angles to it. This quality, which is called gyroscopic

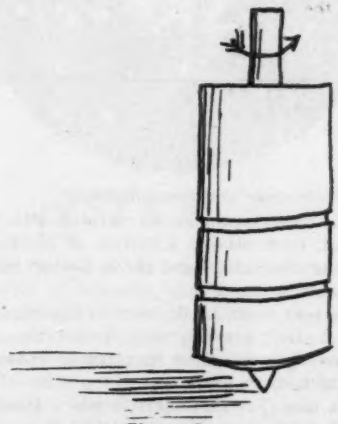


Figure 3.
Tin top empty

precession, is best observed in a specially constructed top called a gyroscope which is really a heavy rimmed wheel mounted in gimbals. Fig 6 shows form of gyroscope, and (the joints all being supposed to be free) the lower arrow shows the direction in which the axis will move on the application of a downward force at its extremity, as indicated by

the vertical arrow. An important practical effect of the gyroscopic action of a projectile is seen in drift of bullets to the right or left, according to the direction of twist of the rifling. The drift is due to the fact that as soon as the projectile leaves the gun it starts falling, which means that the air pressure is

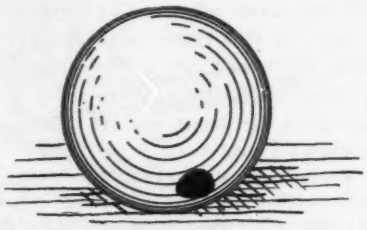


Figure 4

Loaded ball at rest

trying to raise the point of the projectile. But following the law of gyroscopic precession mentioned above, the point of the projectile moves in a direction at right angles to the line in which the force is applied. With a right twist this causes the point of the projectile to move to the right of its original trajectory. This gradual sheering to the right of the point finally steers the whole projectile in that direction, and this is what causes the shell or bullet finally to land to one side of its original direction. Of course, this is only the general principle of the beginning of the motion of drift. The whole motion is quite complicated, and a mathematical analysis of

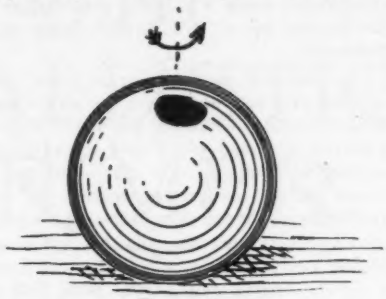


Figure 5

Loaded ball spinning

it is rather extended, though well understood.

It is a fact, also that all the various paradoxical properties of spinning bodies that I have mentioned above yield readily to mathematical analysis, by which they may be investigated, explained, and predicted with accuracy and precision.

Among the projectiles which suggest the effect of some of these properties are the early armor piercing bullet and the tracer bullet. These bullets were inaccurate, and while there were other causes for the larger part of the trouble, it is interesting to note that the lead was in front and the lighter part behind, which is the reverse of the most accurate British bullet, the hollow point Mark IV, and also of the aluminum tipped Mark VII. The gas shell, which is notorious for the peculiar noise produced by its wobbling flight,

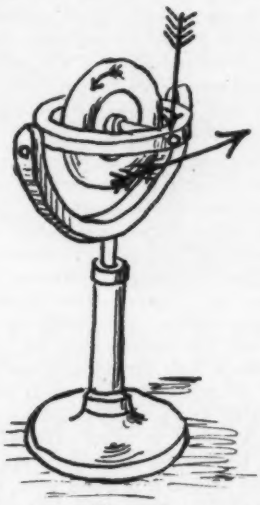


Figure 6

is filled with liquid and thus resembles the raw egg or the tin top full of water in its refusal to spin steadily. These illustrations suggest what a practical interest the subject of tops and other spinning objects has for the bullet designer.

THE ALL-AROUND SHOTGUN

By Capt. Chas. Askins

THE following letter is from Major S. J. Fort, the pistol and revolver man. I am giving it entire because it is interesting of itself, and because other people may wish to know just what the major did.

"Capt. Chas. Askins,

"My dear Sir:

"I note from your book, the American Shotgun, page 166: 'For an all-round shotgun I should favor a pattern of from 250 to 275 shot.'

"This was written before you showed us the advantages of the Super X loads, and being about to substitute a double 12-gauge for my old 1893 Winchester repeating shotgun, may I trouble you for your opinion as to the proper boring for the aforesaid Super X as well as the possible effect of such boring upon the pattern of the ordinary field cartridge.

"It may interest you to know of some experimental work I did last fall with the Super X Cartridges in connection with the wise ducks we have down here, and shot from the above mentioned Winchester, a gun making a phenomenal pattern with 7½ shot.

"A stake with its top just above the water was placed exactly fifty yards from my blind, with my farthest decoy at approximately fifty yards from the same place, leaving a clear space between the two points.

"Anything flying between the stake and the decoys remained with me, provided I held straight, with either Super X or the same load minus ¼ dram of powder, loaded by the Winchester Company. I could determine very little difference between the cartridges except an additional recoil from the Super X. Ducks picked when retrieved showed no more pellets from either than could be accounted for by placing the charge more accurately with one or the other.

"At fifty yards and perhaps ten yards farther out, however, the Super X evidently held the charge in closer pattern than did the other cartridge, but, judging from the spread upon the water, while the pattern held up well and appeared to cover the duck, one duck would be killed as dead as Hector, while the others would be crippled or escape entirely.

"This may be accounted for by my having dropped the shotgun since 1900 for the military rifle and revolver, which with approaching age has slowed me up considerably, so I am quite prepared to have you state that the man behind the gun is more to blame than the gun or cartridge.

"The Ithaca is the double gun chosen, and I feel sure they can give me what I want."

I replied by mail, and the result is that Major Fort has ordered, not an all-round gun, but a double light field gun, retaining his old Model 1893 Winchester for the duck shooting.

After commenting briefly on points Major Fort brings up, we will go into this subject of an all-round gun.

This idea of putting up a stake to mark a certain range is a good one. I shoot a good deal at a certain large pond-hole, and by measuring in one way or another I know the distance to prominent points in all directions. Of course I can tell pretty well how far ducks are off because of their passing over these marks, and neither is there any doubt but what I shoot better on this pond than on any strange ground. The hint may be worth something to somebody.

Not much question but what some guns shoot Super X cartridges better than others—also some guns shoot heavy loads of any kind better than others. Very possibly it would be found that the arm which shoots extremely well with light and standard loads, say three drams of powder and seven and a half shot, will not perform quite so well with three and

a half drams and an ounce and a quarter of big shot. All this would come under the head of learning the gun and what cartridge is best adapted to it, then shooting that cartridge notwithstanding it may not be the most popular. Nearly any gun which performs well and a quarter ounces of big shot will also with three and a half drams of powder and one perform well with Super X. Super X in 6, 5, 4, and 2 shot is a waterfowl load, not intended for field shooting.

Major Fort and about anybody else is sure to run into trouble the moment he attempts to go back beyond the distance he is accustomed to taking ducks. Between sixty and eighty yards Fred Kimble says that he doubled his lead—that is, the lead demanded at sixty yards must be doubled when going back twenty yards farther. Mr. Kimble can tell us that and we will believe him, but we can't put his advice into perfect practice because we cannot tell precisely eighty yards, measured up into the air, and possibly could not precisely double a lead if we tried. The writer can hit ducks pretty well at sixty yards, but at seventy and beyond it is guess work, with the guess that kills one time failing the next time. What I need now and what a lot of other fellows need, perhaps, is about a hundred ducks a day, all passing at seventy to eighty yards.

Concerning slowingup with age, lack of practice or other cause, I have noticed that the veteran duck shot is more liable to maintain form as he grows older than is the field shot, shooting woodcock, grouse, or quail. In fowl shooting the eyesight need not be more than moderately good, for the birds are large and usually have a clear background of sky or water. Neither do I think that slowing up or handling the gun more deliberately makes much difference in duck shooting; more depends upon good judgment in taking the first bird at the proper point, in order to give the second barrel a fair chance. Also, a good deal depends on the shooter learning his own strength and his own weakness as a shot. If he can take incomers better than birds which have gone by, he should not allow either bird to quite pass the gun gefore shooting. Of course it might be the other way about, but I have seen few duck shots who ollowed his birds to pass the gun before taking them. Decoyed ducks which are attempting to alight near the gun are a different and a simpler proposition—too simple once their flight is learned.

Now about the all-round gun. I remember the time when the all-round shotgun was considered the proper thing; we all seemed to believe in the theory that the man with one gun would always bear watching. Some truth in that, of course, but today I am afraid the man who attempts to use one gun for all purposes is in the same class with the jack-of-all-trades who is master of none. No trap shooter would be much afraid of the chap who attempted to use his field gun for clay bird work, and the duck shot would enjoy a quiet grin if some one climbed into the blind with him carrying a six pound twelve gauge. Above everything, the lad who attempts to shot quail or grouse with a heavy, full choked duck gun is not to be feared—he cannot shoot quail never could, never will learn, and whether he has slowed up or not doesn't make much difference.

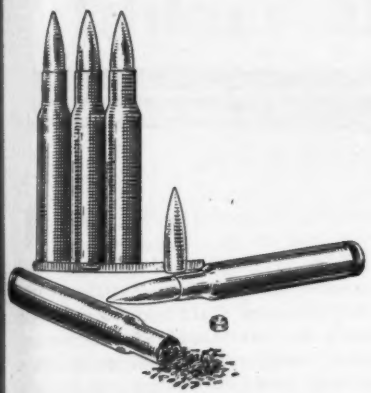
I commenced shoting a great many years ago with this idea of one gun for all purposes firmly in mind. When one gun failed to prove a perfect all-round arm I sold it and bought another which appeared to me to possess all-round qualities in greater degree. My first good gun was a ten bore full choke which I used for every purpose; sold that and bought a heavy twelve full choke, sold that and bought a lighter twelve full choke, sold that and bought a pump brush gun. With the latter I slaughtered quail until I got ashamed of the performance. Found, too, that while the brush gun killed quail it was next to useless for any other purpose, so replaced the open barrel with a modified bore, and eventually with a full choked barrel—after which the gun was set aside for good. Subsequetnly, I bought a full choked twenty which I sold to procure a full choked sixteen, a light arm, and this I presently modified to an improved cylinder and quarter choke—that gun I have yet, but it did not prove an all-round arm, and it about ended my efforts to secure an all-round gun. Along with this light sixteen I procured an eight pound, 32 inch barrelled sixteen for duck shooting, but it didn't prove exactly what I wanted. Right then I went to a heavy Smith twelve bore for ducks and a twenty-eight bore Parker for quail, both full choke. Presently I had one barrel of the Smith modified, and then sold it because the single trigger did not give me an instant choice of barrels; the Parker was sold because it shot too close for me.

Too much space would be required to give all of my gun experiments in attempting to procure arms which I thought would suit me. Sufficient here that I worked both ways from the middle, getting farther and farther away from anything that approached an all-round gun. At present my duck gun is a twelve bore weighing eight and a half pounds, 32 inch barels, full choked, a Super Fox shooting 1⅝ ounces of shot in three inch cases. It is no more an all-round gun than an eight gauge would be. My favorite quail guns are a twenty bore, 28 inch barrels, quarter and half choke, weighing six pounds, and a sixteen, 30 inch barrels, weighing under seven pounds, improved cylinder bored. I shoot the twenty until for some reason I have gone a little off form with it, and then pick up the opener shooting sixteen, and go to hitting quail again right along. I wouldn't like to be without the one gun to supplement the other.

My only excuse for going at such length into an enumeration of my own experience is that I believe some such thing is happening with numbers of shooting men. Instead of the one all-round gun they are collecting a small armory of special purpose weapons, a trap gun, a heavy arm for ducks, a light one for quail, and maybe a special grouse and woodcock piece. No upland or field gun, it seems to me, ought to weigh over seven pounds, preferably nearer to six; whether the arm is to be a twelve bore, a sixteen, or a twenty is a matter of personal preference. There is no more killing upland gun than a light twelve though the latest development in ammunition is having a tendency to crowd it out, the twenty now shooting a full ounce of shot and the sixteen an ounce and an eighth. Few would care to shoot more than this latter charge in a twelve bore, which would place the sixteen and the twelve on a like basis for field work.

I wouldn't myself order another field gun which weighed over six and a half pounds, and on the other hand wouldn't select a duck gun which weighed under eight pounds, or one which handled less than an ounce and a quarter of shot. The two arm cannot well be brought together in one piece. A nearly perfect quail and grouse gun is a six and a half pound twelve, 28 inch barrels, shooting three drams of powder and an ounce and an eighth of shot; nearly if not quite as good is a sixteen bore, same length of barrels, weight six and a quarter, shooting practically the twelve bore load, and for the man who is ample oportunity on quail there is the six pound twenty bore, choked a trifle closer than the sixteen or the twelve. For the highly skilled duck shot who is capable of landing on his bird at very long range there is the full choked ten bore weighing ten pounds, 32 to 36 inch barels, shooting an ounce and a half of shot or more. Next and nearly as good, the heavy twelve throwing an ounce and three eights of shot, or for the man who prefers standard ammunition an ounce and a quarter. The sixteens and the twenties can be made to do for ducks, of course, but they will never outshoot the twelve, and if ordered of a weight and style of boring suited to duck shooting are ruined for other purpose.

Now there remains the all-round gun. I still think that it should be about what I pronounced it when writing the American shot gun years ago—a twelve bore weighing seven and a quarter to seven and a half pounds, one barrel patterning 250 and the other 275, using an ounce and an eighth of 7½ shot, with not exceeding three and a quarter drams of powder. Such a gun would suit me anyhow, if I could own but one arm. I shouldn't like to carry it all day on a long tramp, but could do it, and in the duck blind would have to forego the long shots but would get the fowl that came in close. As a snipe gun or a gun for chickens the patterns would be about right. Woodcock would be riddled sometimes, and grouse might be missed oftener than they should be, but the gun would do. At clay birds such an arm should come within five birds of a special single trap gun, which would matter little to the man who lost ten or fifteen birds in the hundred anyhow. Upon the whole, I'd say that the all-round gun was for the husky youngster, who could carry anything and didn't care much what it was so long as it would shoot.



THE BALLISTIC PRIMER

by

J. C. GRAY

PART III—CHAMBERS AND RIFLING

SO FAR in the discussion of problems connected with the design of small arms the items which have been covered include the bullet, cartridge case, primer and powder. As will be noted, these are all related to ammunition and no mention has been made of the gun itself.

Gun design may be considered as presenting two major questions, assuming that the matter of ammunition has been determined. First comes the question as to the characteristics of the gun barrel, and particularly the chamber and bore; and second, the matter of "type" of weapon, including questions as to the loading mechanism, whether single shot or repeater, lever or bolt action, form of magazine and, in these days of automatic arms, that of making a self-loading rifle.

To a certain extent the answer regarding type of rifle is dependent on the answer found for the second question, but in general it may be said that one can design practically any form of arm around a suitable cartridge, chamber and bore. With this in mind, the items to be considered will be confined to those included in the first question as stated.

The general shape of the chamber is governed by the form of the cartridge, but its actual dimensions are constantly a source of dispute between the production manager and the ballistic engineer by reason that the former always wants to have greater "tolerances" than the latter.

"Tolerance" is a term applied to allowable variations in dimension within which certain parts will fit. The necessity for such a variation will be apparent when it is realized that tools *will* wear, regardless of how well they may be made.

If bullets, cartridge cases, chambers and bores of small arms could be made so that there was no variation even in the minutest degree, it would be possible to manufacture weapons of greater accuracy and precision, because the various parts could then be made to fit each other so accurately that there would be no chance for the bullet to be delivered into and from the bore other than in exactly the same way at every shot. This is unfortunately an impossibility because, as has been noted, there is always an appreciable amount of wear on tools.

However, there are parts of the chambers where it is not necessary to have exceedingly close tolerances and, on the other hand, the bearing of the neck of the case and the bullet seat are, assuming proper design of the bore and rifling, the controlling factors in determining the accuracy of the rifle.

It may be of interest to note here that, when the caliber .30 Springfield rifle was first designed, it was intended to use in it a bullet similar in shape and weight to that used in the old "Krag." The chamber and throat were designed accordingly and the accuracy of the arm, as originally made, with this type of bullet, was quite satisfactory. Shortly, however, it became apparent that the so-called "Spitzer" type bullet offered many points of advantage. It was accordingly decided to design a bullet of this type for the Springfield.

After some ammunition with this latter shape of bullet had been made, it was fired from the rifle for accuracy and the results were anything but gratifying. In fact, the thing would not "hit a barn door." The credit for discovering what was wrong, and the proper remedy, belongs to Colonel Samuel Hof, of the Army Ordnance Department. The trouble was that the new bullets were different in shape to such an extent that they would not "seat" properly in the throat or lead of the bore. As soon as the bullets were pulled out of the case a little further and seated properly against the rifling the results of accuracy firing were quite satisfactory. As a very considerable number of rifles had already been made it was decided to rechamber them, and this was done by cutting off a sufficient slice of the barrel at the breech so that the bullet seat was moved forward about two-tenths of an inch.

Recently it has been thought that tolerances should be noted on drawings as plus or minus, as might be necessary, but in one direction only, and that direction normally such as would indicate the allowable wear on tools. For example, if we start off with a reamer 0″.5 in diameter, after this has been used a while its diameter will be *less*. Therefore, in stating dimensions on a drawing, we might properly indicate the diameter of the hole at 0″.5, with a *minus* tolerance of 0″.015, thus "0″.5—.015."

On the other hand, take a sizing die, say of diameter 0″.485, after some use this diameter will be greater, and we would express the allowable tolerance as a plus quantity, thus "0.485 + .015." But suppose we wanted to put the result of the sizing operation into the reamed hole as indicated above. They wouldn't always go, because we might have a maximum of .50 (0″.485 + ″.015) into a minimum of .485 (″.5 -.015). So it will be seen that in order to insure a fit under all circumstances the maximum in one case must be made equal to the minimum in the other, unless, as is the case with bullets, it is expected at times to have a "push" fit.

Tolerances must be provided for in the cartridge case and bullet, then, as well as in the chamber and bullet seat, so that we may be sure that a proper functioning of the various items will be obtained under all circumstances.

Bearing in mind what was said in the preceding paragraph, it will be practicable to proceed with the design of a chamber and lead (or bullet seat) for the caliber under consideration. First, however, it may be well to discuss for a moment the tolerances found in the caliber .30 Springfield chamber and lead. This latter is found to be about ″.2500 long with a minimum of ″.2300 from the end of the chamber proper to the top of the lands, that is, where the bore diameter approximates the dimension ″.300. We find that the bore diameter is held to a minimum of ″.2999 and a maximum of ″.301, or a "tolerance" of ″.0011—eleven ten thousandths of an inch. The groove diameter may vary from ″.309 maximum to ″.3079 minimum. Suppose it were possible to have a minimum bore with a maximum groove diameter. In such case the height of the lands would be a total of ″.0091, or assuming equal depth of grooves, each groove would be ″.00455, four hundred fifty-five hundred thousandths of an inch. On the other hand, if we had a maximum bore with a minimum groove diameter the depth of the grooves would be three hundred forty-five thousandths of an inch, a "tolerance" in the depth of grooves equal to eleven ten thousandths of an inch, being exactly the same as the diameter tolerance at the beginning of the bullet seat. Diameter tolerances at the neck of the chamber are about the same and continue so all the way towards the breech. There are longitudinal tolerances in the length of bullet seat amounting to ″.02, and certain

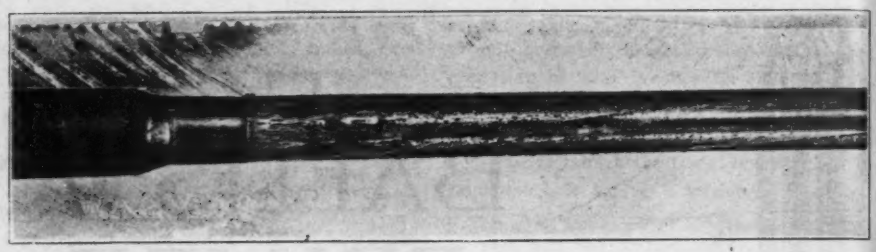
a spiral with varying pitch, which started with allowable variations in what is called "head space" amount to about 0".0075. The cartridge under consideration, having a bearing rim on the face of the breech, probably will not require such close chambering as regards length.

In leaving the consideration of the Springfield chamber, it may be said that, while the specially chambered rifle, in the hands of an expert, with hand weighed charges, spun bullets and cartridge cases turned to dimension at the neck would probably show greater accuracy than the Springfield, yet of say ten selected rifles produced by the Springfield Armory as against ten special rifles, the better average of accuracy would probably be shown by the armory product.

In looking over the design for a cartridge of .25 caliber previously shown, it will be noted that the bullet projects quite a way from the neck of the case, in fact this dimension is ".805, while the length of the point from the place where it reaches bore diameter is 0".6475, leaving 0".1576, or over one-half a caliber which will be supported by and in the bullet seat or lead. It may be interesting to note that the Swiss service bullet which has a taper base and is of caliber 7.5 m/m, does not have any cylindrical portion at all and is apparently seated on the lands for a distance of about 0".15, which will be seen to approximate the same dimension in the design shown.

Close seating has quite a bit to do with the life of a gun barrel because the less powder gas gets past the bullet—in other words, the closer the bore is sealed—the longer the barrel will wear. Barrels do not "go bad" by reason of the abrasion of the bullet jacket on the steel, but because the hot gas, escaping past the bullet, impinges on the bore and in effect "washes" the surface away. It may be of interest to see what the inside of a worn barrel looks like, and this is well shown in the illustration.

Too much stress cannot be placed on the necessity for supporting the bullet in the throat, and for having as small as possible a "jump" before the bullet takes the rifling. It might almost be said with truth that, unless this condition be filled, no matter how good



How the inside of a worn barrel appears

the general workmanship and design of the arm and ammunition may be, it will be impossible to obtain other than mediocre results at the target. This is the main reason for the wonderful scores made with muzzle loading outfits or those in which the bullet is first seated in the rifling and the cartridge case and charge inserted afterwards.

Taking up the consideration of the matter of rifling, if one looks over the military rifles in use it will be found that every nation has adopted a plain square shouldered concentric groove and that the number of grooves is four in every case. There must be some reason for this almost universal choice and it will be found the reason is that four grooves will do as well as more and the manufacturing processes are reduced to a minimum.

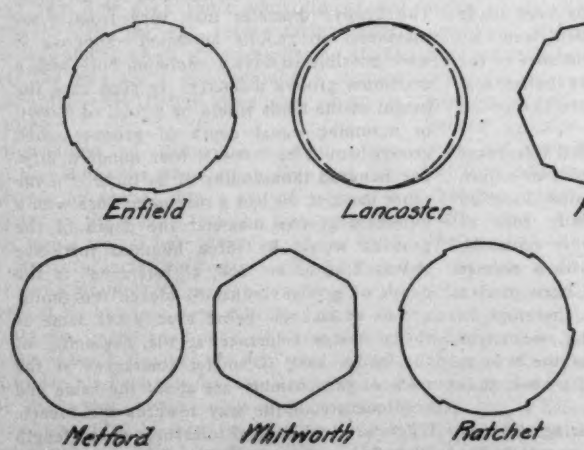
Of course, it is true that the greater the number of grooves the less work each is called on to do on the bullet and there is consequently a greater distribution of the stress on the bullet from the driving shoulder. In the days of soft bullets this was important in its relation to "stripping," but modern practice in making bullet jackets has removed any such impediment to the use of a minimum number of grooves.

At various times almost every conceivable shape of groove has been proposed for use, from the so-called Lancaster "Oval bore" to a ratchet type. The oval bore is quite good, but is rather difficult to manufacture and shows no marked advantage over the plain concentric groove. Among the most prominent types which have been used are the Enfield, with flat sides and concentric bottoms to the grooves, such as we mostly see in modern rifles; the Lancaster, with two grooves cut opposite each other and formed without any rib or edge, so that the barrel has an oval appearance; the Henry, with grooves having a flat bottom and a rib or re-entering angle filling up what would otherwise be the deepest part of the cut. The Metford system involved the use of segmental grooves somewhat similar to the form recommended by Forsyth and a slow twist and increased towards the muzzle. Other types shown include the Whitworth form which has flat sides and corners and made it necessary to use a "shaped" bullet. Probably Sir Joseph Whitworth was also the first to discover that a taper base gave a projectile increased range and velocity, way back about the middle of the last century.

There was an idea in the minds of certain designers and users of rifled arms that the increasing spiral was an advantage and for many years cannon were made with this form, although its use in small arms has been somewhat limited. Recent experience tends to show that the increasing pitch is rather the opposite of good in its effect, and practically all rifled arms are today made with a uniform pitch of rifling. The theory was that the bullet or projectile starting from rest, would acquire velocity and spin gradually, and thus not be so liable to strip. However, the increased pitch rifling really seems to do more work on the bullet by reason that the difference in pitch means an increasing change in the form of the groove made on the bullet all the way along the bore, whereas the uniform spiral, once started, continues the same. As far as accuracy goes, there is not much to choose, and it is easier to make rifling with a uniform pitch.

The real question lies not so much in the form, perhaps, as in the depth of the grooves. This must be so chosen that the barrel will wear well, that there will be a good grip on the bullet and so that the bullet will not be unduly distorted. It was formerly customary to make grooves quite deep. In fact, the U. S. Rifle Model 1841 (the old Harpers Ferry rifle) had grooves ".013 in depth at the breech. Such great depth has been found to be unnecessary and modern rifles will be found to have rifling varying from ".0025 to ".0045. It may be interesting to note that a human hair will be somewhat between say ".0015 and ".003 in thickness.

The all important question in rifling a barrel is to so select the "pitch", or angle of twist, that the bullet will have a sufficient "spin" to make it travel point on and not "tumble", and to keep this pitch down to the minimum required for accuracy.



Various Forms of Rifling which have been used.

Military Marksmanship in Relation to Eyes, Race and other Factors

By Col. W. P. Chamberlain and Maj. Albert J. Love, Medical Corps, U. S. A.

IS THE ability to acquire proficiency in marksmanship with the military rifle in any way dependent upon, or related to the color of the eyes? A careful examination of the literature which is on file in the Surgeon General's library fails to disclose any publication containing accurate information upon this question. While it is recognized that it is a matter of no material scientific importance, it seems, however, to be one of some general interest, since references to the subject in conversation and in the press are not infrequent. Consequently an attempt was made some months ago to compile statistics upon this and other factors which might have a bearing upon the ability of the soldier to demonstrate skill in rifle practice.

The names of approximately 3,500 individuals, including officers and enlisted men, both white and colored, who had displayed proficiency in shooting during the years 1910, 1911 and 1912, were secured from the Department General Orders in which it was formerly customary to publish each year the names of all those qualifying as marksmen, sharpshooters, or expert riflemen. The highest rating only was used for any of those who qualified in more than one of the different grades during the period in question. In addition to these, the names of approximately 2,100 others who had recently qualified were furnished by the senior medical officers at various stations in a reply to a letter from the Surgeon General's Office, dated March 9, 1920.

It was recognized that a number of factors might exert an influence upon the soldier's ability to qualify in marksmanship, or upon the grade in which he did so. Consequently, when collecting the data referred to in the preceding paragraph, a mimeograph form was prepared which provided space for recording the following information:

1. Name (both surname and Christian name).
2. Rank
3. Company.
4. Arm of service.
5. Number of regiment, if assigned to a combatant branch of the service.
6. Age.
7. Years of service.
8. Military qualifications in marksmanship[1] (recorded as expert rifleman, marksman or sharpshooter).

[1] To qualify as an expert rifleman a soldier must score 253 points from a maximum of 300; a sharpshooter, 238; and a marksman, 202 (1).

9. Date of highest qualification obtained.
10. Race (recorded as White, Negro, Filipino, Porto Rican, Indian, and others).

Reprinted from The Military Surgeon October 1922

11. Nativity (recorded as American, Austrian, Canadian, Danish, English, German, Hungarian, French, Irish, Italian, Russian, Scandinavian, Scotch, Turk, and others).
12. Visual Acuity (recorded separately for the right and left eye as 20/20, 20/30, 20/40, 20/50, 20/70, 20/100).
13. Color of the eye (recorded as blue, gray, greenish, brown and black).
14. Color of the hair (recorded as flaxen, red, light brown, dark brown, black, and gray).

For the men who had qualified during or prior to 1912, the data in regard to race, nativity, visual acuity, color of eyes, and color of hair were obtained from the report of physical examination rendered when each individual last entered the military service; the other facts were secured from the Department Orders and the enlistment papers of the soldier. In the case of those whose names were furnished from stations, all data were supplied from local records by the medical officers making the reports.

In recording the color of eyes and hair, those colors were of necessity selected which appeared upon the individual physical examination forms. Subsequently, in studying the cases *en masse*, the eye colors were classified into two groups: first, blue, including the blue, gray, and greenish eyes; and second, brown, consisting of brown and so-called black eyes.

A superficial survey of the material obtained showed that apparently a number of factors were closely interrelated in their influence upon the ability of the individual to qualify in marksmanship, viz, color of eyes, color of hair, age, length of military service, rank, race, place of birth, and visual acuity.

Fortunately for the purpose of this study, data were available showing the color of eyes and of hair among approximately 100,000 World War veterans. When these soldiers underwent physical examination just prior to demobilization in 1919, certain anthropological data were collected and recorded for each of them. This work was carried out at stations located in various sections of the country so that no one racial group should predominate, as might have been the case if all measurements had been taken at a single point. The data obtained, including those relating to the color of eyes and hair, were published in "Army Anthropology" (2). Of the 101,704 World War veterans for whom these particular data were recorded, 61,925 had either clear blue eyes or blue eyes with brown spots, and 39,779 had light brown or dark brown eyes. Classifying the first two groups as blue and the latter two as brown gives in each 1,000 men 609 (608.88) with blue, and 391 (391.12) with brown eyes.

Influence of Color of Eyes on Marksmanship

Table 1 indicates that among the 5,512 soldiers qualifying either as expert riflemen, sharpshooters, or marksmen, 605 in each 1,000 had blue eyes and 395 had brown eyes. It is obvious that in this group of individuals who qualified the ratio of the blue-eyed to the brown-eyed men was practically the same as that prevailing in the general male population as indicated by the examination of 100,000 soldiers at date of demobilization. It consequently appears that the ability to qualify in military marksmanship is in no way dependent upon the color of the eyes. Table 1 also shows that the proportion of the blue-eyed individuals qualifying in marksmanship among the white soldiers was above the average for blue-eyed men in the general male population, white and colored, while the proportion of the brown-eyed marksmen among the Negroes was much above that for the general mixed male population. Practically all of the Negro soldiers qualifying in marksmanship had brown eyes, due to no superiority in eyes of that color but to the fact that practically all Negroes have eyes of that type.

Using the proportion of blue eyes to brown eyes among the Negroes who qualified in marksmanship as a measure of the probable proportion in the general colored male population, and deducting in that ratio 6,150 Negro soldiers (the approximate number included in the 101,704 men for whom the basic measurements were obtained in connection with the study of "Army Anthropology"), we obtain an estimate of 61,775 demobilized whites with blue eyes, and 33,779 with brown eyes. From these data the proportion of blue eyes to brown eyes for *white troops* only would be as 646

TABLE 1.—EYE COLOR BY RACE AMONG THOSE QUALIFYING IN MILITARY MARKSMANSHIP

Race	Absolute numbers			Distribution per 1,000s	
	Blue	Brown	Total	Blue	Brown
White	3,329	1,873	5,202	639.95	360.05
Colored	8	302	310	25.81	974.19
Total	3,337	2,175	5,512	605.41	394.59

(Continued on page 21)

The American Rifleman

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A Nation-Wide Demand

ABOUT the only argument advanced in favor of the ever present Anti-firearm menace—except utterly purile and easily controverted statements such as that the abolition of weapons will abolish crime—is the claim that there is "a nation-wide demand for such legislation."

The citizens who are supposed to be making this demand however, always remain unidentified. Here and there, crops up some reformer or some politician who is fathering such a law, but these cannot by any stretch of a febrile imagination constitute "a nation-wide demand." And so for the most part, the proponents of anti-firearm legislation remain nameless.

It is well for the chances of such legislation that this is so. Few voters, unless they chance to be politicians or reformers, would persist in so absurd a stand if they were fully informed as to the great potentialities for evil which follow in the wake of anti-firearm laws.

Publicity is the card on which the reformer and the politician depends to convince the average sane citizen that the "nation-wide demand" about which they prate, exists. Publicity is the one way by which it can be proven that no such demand does exist.

Every man who believes that "the right to keep and bear arms shall not be infringed," who believes that this is one of the essentials keeping our nation free from the domination of criminals and Bolsheviks, must let the newspapers of his locality know how he feels. If this is done it will soon be apparent that there is "a nation-wide demand" that such proposed laws never disgrace our statutes, or place the law-abiding citizen at the mercy of the lawless.

A National Match for Boys

NATIONAL Match training, which has proven in the past so effecacious in developing proficient marksmen among adult citizens may confidently be counted upon to work quite as well—if not better—when applied to boys. There is, therefore, little doubt as to what the result will be when the principles of intensive instruction in marksmanship, accompanied by a series of carefully thought out matches, are applied to a group of youngsters this year at Camp Perry.

During the first ten days of the National Match period, a score or more members of the W. J. R. C. will be under canvas on the Lake Erie Range. There will be provided an attractive daily athletic program in connection with the real object of the camp—intensive instruction in the use of the small-bore rifle, including a series of lectures, and a schedule of matches in which the boys can apply the technical information which they have acquired. The matches have been so arranged that the shooters automatically classify themselves by their scores, and having qualified in the simpler events, are entered in others which progressively call for greater skill from the shooters. The match series will decide several class championships. The boys will attend the matches under the same conditions as adult citizens, their only expense being for transportation and for subsistence while on the range.

From time to time, here and there, boys have attended the National Matches. In the past, however, they have come with their parents, and have only entered one or two of the small bore events. It is impossible under existing conditions for the government to pay the expenses of a camp for boys in connection with the National Matches. Yet the attendance of boys interested in marksmanship should be encouraged, and the idea of a boy's unit at Camp Perry is a good one, and one which within a very short time should bear fruit, in an increased number of rifle clubs, as soon as the boys grow old enough to form them. One of the surest ways to clinch a boy's interest in any sport is to take him out where men are indulging in it as a recreation. Instantly—whatever the sport may be—it becomes a desirable past-time.

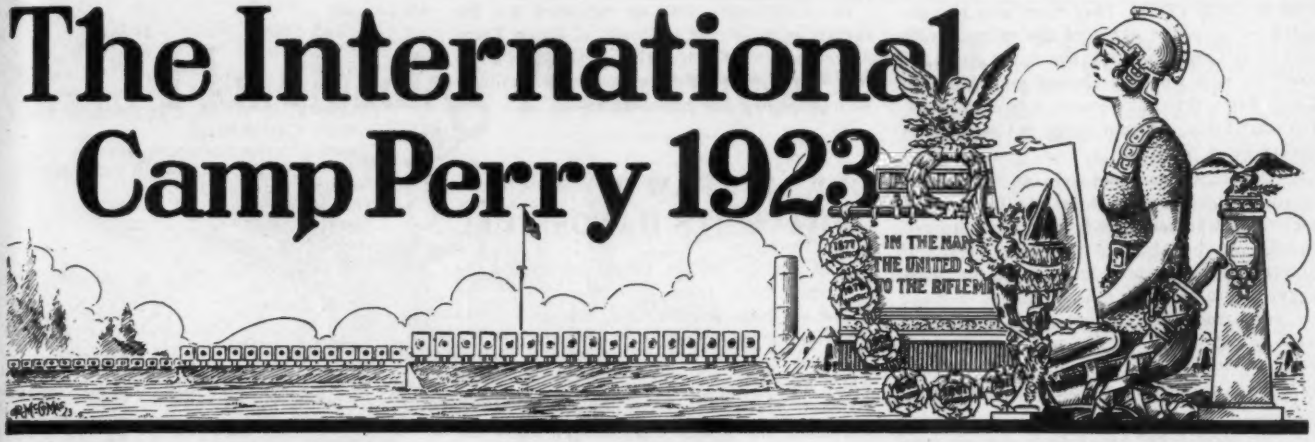
Rifle Club members can help the good work along by inquiring whether there are any W. J. R. C. boys in their particular localities and talking to them of the benefits which follow a visit to the big National Match Range.

Is It Worth While?

IN COLD hard cash attendance at Camp Perry is worth while. It has probably never occurred to a majority of riflemen in this country that over ten thousand dollars in prizes will be distributed in the NRA Matches alone this year. Furthermore, one man in every four competing in the matches receives a share of this prize money.

Incidentally, when some sporting friend inquires as to what it is possible to get out of the rifle shooting game—after you have told him of the steadier nerves, keener eyes and clearer brain, you might add a word as to the Argentine Trophy which stands 32 inches high and is of silver assaying 99% pure, of the Wimbledon cup, representing the best that the craftsmen of England were able to produce in 1874 and surrounded with the tradition of continual competition since that year. You might mention something of the story of the Soldier of Marathon dating from 1875, the Palma, first fired in 1876, the Hilton, in competition since 1878. Do not overlook the National Trophy which is as far as we know, the only trophy for competition among the citizens of the United States now in existence that has been authorized by specific Act of Congress. Mention a few of these things and ask if his pet sport can show anything more worth while.

The International Camp Perry 1923



TROPHIES FOR SMALL BORE MATCHES

The Marksman Trophy

COMPETITION on the Small Bore Range at Camp Perry this year will be stimulated by the presentation of at least six new trophies, the gifts of individual friends of the game and of the Cartridge Companies. These trophies will be offered in the various major matches—team and individual—of a greatly enlarged and attractive schedule of events.

Among the first of the trophies to be received was the Marksman Trophy, which will go to the winning team in the East and West Match, an event to be shot for the first time this year.

The Marksman Trophy is a cup of graceful proportions and splendid workmanship, surrounded at its base by miniature .22 calibre Springfield rifles. It is 20 inches high, exclusive of the polished wood pedestal which is encircled with shield upon which the record of the winners will be inscribed. Upon the cup appears this dedication:

THE MARKSMAN TROPHY
Presented by
The Western Cartridge Company
to
The Small Bore Riflemen
of
America
for
Annual Competition

The conditions for the new competition are:

THE EAST AND WEST MATCH
Squadded Team Match

OPEN TO: Two teams of ten (eight shooting, captain an coach), one from East and one from West of the Mississippi. Each team to be selected by the Team Captain appointed by the N. R. A. The Team Captains will select their own coach. Service men who may be members of the team will represent the State in which they were born.

WHEN FIRED: Wednesday, September 19, at 7:30 A. M.

ENTRIES CLOSE: Sunday, September 16, at 8:00 P. M.

THE MARKSMAN TROPHY

COURSE: First Stage: Slow fire, 150 yards, Target "C 5", 2 sighting shots and 15 shots for record.
Second Stage: Slow fire, 175 yards, "C 5", 2 sighting shots and 15 for record.
Third Stage: Slow fire, 200 yards, Target "C 5", 2 sighting shots and 15 shots for record.

ARM: Any .22 cal. Rim Fire.
SIGHTS: Any.
AMMUNITION: Any .22 cal. Rim Fire.
POSITION: Prone.
PRIZES: To the winning team—The Marksman Trophy and gold medals. Bronze medals to the second team.
ENTRANCE FEE: None.

SPECIAL FARES TO CAMP PERRY

SPECIAL fare and half fare certificate plan have been granted by the New England Passenger Association, Trunk Line Association, Central Passenger Association, Trans-Continental Passenger Association, Western Passenger Association, Southwestern Passenger Association, Southeastern Passenger Association. These passenger associations cover practically every railroad in the country so that all members of the National Rifle Association and duly accredited delegates will be able to effect a material saving on transportation this year.

It should be noted that members from California, Nevada, Oregon and Washington have available to them summer excursion rates which are a little lower than the fare and half fare rate. Members from these states should, therefore, purchase an excursion ticket to Toledo. Members from all other states should secure fare and half-fare certificates at the time their tickets to Camp Perry are purchased.

The following regulations govern the issue of these certificates. They should be carefully studied and followed in every detail.

1. Certificates may be secured from any point where the cash fare to Camp Perry is sixty-seven cents or more.

2. Children of five and under twelve years of age, when accompanied by parent or guardian, will, under like conditions be eligible for one-half fare certificates.

3. Certificates must be obtained from ticket agent at starting point or the nearest station issuing through tickets to Camp Perry, and in order to be valid for the reduced fares returning, they must be endorsed by the Secretary of the National Rifle Association on ar-

rival at Camp Perry. They must also be validated by a special agent of the railroad who will be at Camp Perry on the dates given below. Be sure when purchasing your ticket to Camp Perry that you request a fare and half-fare certificate. *Do not* make the mistake of asking for a receipt.

4. Certificates are not kept at all stations. If you inquire at your home station you can ascertain whether certificates and throngh tickets can be obtained to Camp Perry. If not obtainable at your home station, the ticket agent will inform you at what station they can be purchased. You should then purchase a local ticket to the station which has certificates in stock and there buy your through ticket to Camp Perry and obtain your certificate.

5. It should be noted that special rates apply not only to members and delegates but to the dependent members of their family, including their wives and children.

6. No refunds of fare will be made on account of failure to obtain proper certificates at the time of purchasing ticket to Camp Perry nor because of failures to present validated certificates when purchasing return ticket.

7. It is necessary that a minimum of 250 certificates be presented at Camp Perry for validation in order that the special rates may be effected. There is no doubt whatever but that far more than this number of certificates will be presented if all the members and delegates attending the matches not only from the distant points but from the nearby points will obtain certificates as outlined. The nearby shooter owes it to the men who come from a distance to obtain certificates in order that where the fare is sixty-seven cents or more every one will be able to take advantage of the reduced fare which the National Rifle Association has succeeded in getting through.

8. Tickets to camp Perry may be purchased August 29th to September 12th, both dates inclusive, in all states except Colorado, Idaho, Montana, New Mexico, Utah, Wyoming, Oklahoma and Texas in which states tickets may be purchased between the dates of August 28th and September 11th, inclusive, and in the states of Arizona, California, Nevada, Oregon and Washington in which states excursion tickets may be purchased up to and including September 15th. The following Southwestern roads are not parties to the reduced rates:

Arkansas & Louisiana Missouri Ry.
Ft. Smith and Western R. R.
Graysonia, Nashville and Ashdown R. R.
Jonesboro, Lake City and Eastern R. R.
Kansas, Oklahoma and Gulf Ry.
Louisiana and Arkansas Ry.
Mississippi River and Bonne Terre Ry.
St. Louis, El Reno and Western Ry.

Members or delegates living on these lines should purchase local tickets to the nearest junction of some line which is a member of the Southwestern Passenger Association.

9. Return tickets may be purchased from Camp Perry up to and including September 27th.

10. Certificates will be validated by the special agent of the railroads at Camp Perry September 1st, 3-8, 10-15th and 17-19th, inclusive. Certificates which have not been validated by the 19th will be worthless.

DEWAR TEAM TO HAVE ITS HANDS FULL

THE history of the Dewar match for the small bore team championship of the world has been anything but a story of easy victories for the Americans. Great Britain has only had the trophy twice in the nine matches which have been fired, but the majority of the matches have been very closely contested, and since the match was changed from the gallery to an outdoor small bore competition, the lead of the Americans has been reduced each year. Now comes word from Canada through the columns of the Canadian shooting papers that the small borers of the Dominion are becoming thoroughly aroused over the showing that they have made in the Dewar Match in the past few years, and when the Canadians become aroused, things usually happen. Accordingly, the American team this year is not only up against the proposition of once more taking the British team into the Camp in face of the steady climb toward the top that the English riflemen have manifest since 1919, but it is very probable that the Canadians will be very much in the race.

The history of the Dewar is not generally known by the .22 calibre riflemen who have come into the organized ranks in large numbers during the past few years. A brief resume is accordingly given below. Plans for the Dewar Team tryouts and preliminary practice were outlined in the June first isue.

SIR THOMAS DEWAR TROPHY

International cable match
Original conditions calling for 50 men per team; 75 ft. gallery; Iron sights.
Any position, 30 shots per man
Any rifle not over .230 calibre

1909—April 19	
Great Britain	14,583
United States	14,179
Australia	14,160
1910—April 2	
Conditions changed to permit telescopic sights 50 shots per man	
United States	24,539
Great Britain	24,439
Australia	23,883
1911—No Match	
Dates set by Great Britain were in June, too late for our gallery season.	
1912—April 20	
Telescopes again barred	
Great Britain	24,548
United States	24,291
Canada	23,671
1913—April	
Conditions changed to call for .22 rifles	
United States	24,542
Great Britain	24,510
Canada	23,092
India	21,099
1914—April	
United States	24,593
Great Britain	24,571
1919—August 23	
CALDWELL, NEW JERSEY	
Competition resumed as Outdoor Small Bore Cable Match	
Twenty competitors per team	
Twenty shots each at fifty and one hundred yards.	
United States	7,617
Great Britain	7,523
1920—August 22	
CAMP PERRY, OHIO	
United States	7,649
Great Britain	7,565
1921—Sept. 18	
CAMP PERRY, OHIO	
United States	7,735
Great Britain	7,602
Canada	7,308
1922—CAMP PERRY, OHIO	
United States	7,685
Great Britain	7,645
Canada (retired)	

ANOTHER NEW TROPHY

THE Navy has announced its desire to award the *NAVAL TROPHY* for annual competition at the Matches. It has been felt that the NRA Off-Hand Match probably best exemplifies the spirit of Navy Marksmanship as typified by landing parties, street fighting, etc., and this match which already has historic background, dating from 1910, has accordingly ben designated the Navy Match and will be so known in the future.

THE PALMA MATCH

THE Palma Trophy is one of the most historic rifle match trophies still in competition in this country. It was presented to the riflemen of the world for perpetual competition in 1876 on the occasion of the great Centennial celebration in Philadelphia. It really perpetuates the Long Range Team Championship of the World matches which were instituted in 1874 between the Irish team, champions of Europe, and the Americans at Creedmoor, N. Y. The conditions require that the match for the possession of the Trophy be fired in the country holding it at the time of the competition. The Trophy has a varied history and American Teams have been sent to England once and to Canada twice in efforts to bring it back from the alien victors. A third match was fired in Canada on one occasion when the rule that the match must be fired in the country of the last winner was waived by the Americans.

The Palma was last fired in 1913 at Camp Perry, Ohio, on the occasion of the International Matches in that year. The war has prevented a renewal of the match till this year. The match, representing the Long Range Team Championship of the world is fired at 800, 900 and 1,000 yards. Eight firing members to the team. 15 shots for record and 2 sighters, per competitor at each range. Match rifles.

Major K. K. V. Casey, a veteran of several Palma matches, has been appointed Team Captain. This team, too, will be selected from among the riflemen on hand at Camp Perry. Details as to the plan to be followed in selecting the team will be published in these columns as soon as they have been definitely worked out.

Handloading Ammunition

By J. R. Mattern

CHAPTER XIX

REDUCED LOADS

BACK in the days of the 45-70 as the army rifle and the dependence of a host of hunters, the reduced load idea was highly developed as a practical thing needed by every rifle shooter. Today, however, perhaps the majority do not appreciate the advantage of having a supply of such ammunition for their powerful rifles, and might not know how to use it effectively. For practical shooting the need for it under present conditions is greater than ever both in the woods and on the target range. No handloader should even consider confining his work entirely to full charges. In fact, the chief reason for handloading is to obtain reduced charges. The first "high power" rifle owned by the writer was a 303 Savage. Each year it was the custom to buy 200 factory full charge cartridges, but this ammunition was perhaps only a tenth of the total used. The rest was made up of a cast bullet and various charges of powder. One charge much used was a 32 Long rim fire case full of King's smokeless shotgun powder, and I well remember with what fears this charge was tried when raised from the 32 Short case full of that powder. Probably the greatest amount used was eight or nine grains weight. Anyhow, it was so light that the report was insignificant. One day a farmer refused to use it for shooting his hogs on the ground that the bullet might glance from the skull. It actually would drive the bullet through the head in any position. When the bullets were well made and the loading was done with care it was a famous sparrow load, capable of picking off those small marks up to fifty yards. Good loading was a problem, however, as we had not progressed in those days to the point where we saw the necessity of investing real money in dies for resizing the expanded cases.

The uses and advantages of reduced loads today are well rought out by a review of such of them as have been popular. My old 303 Savage load accounted for uncounted dozens of game animals and birds. Its stock was notched for items from deer and bear down to rabbits, or maybe squirrels. Anyhow, when the boy thought he had outgrown a mere 303 Savage and attempted to sell it, he had to buy a new stock. The purchaser objected to the old one because it was notched all along its top and bottom edges. Only reduced charges could make the old 303 such an all-round useful gun.

The 45-70 reduced loads were made up of small charges of black powder behind a round ball of 148 grains weight, a "collar-button" bullet of about the same weight, or a short grooved bullet of 245 grains weight. Some shooters also used the 300-grain or the 405-grain bullets. The soldiers in isolated army posts employed such loads for killing game for food. The National Guard in particular employed them for target practice at short ranges.

It was natural, therefore, that when the Krag 30-40 cartridge was produced, a reduced charge for it should be worked up. Dr. W. G. Hudson developed the first of them after lengthy experiments in which some groups at 200 yards were two feet in diameter, but others were only three inches. The latter were made with cast bullets of about 180 grains weight and 12 grains of a smokeless powder greatly like our present Sharpshooter. None of the more modern and better-adapted brands of smokeless were then available.

The 30-30 always has been available in "short range" factory loading, and one of the features of the Savage cartridges was their "miniature" loads, for practice shooting and for killing small game. The 30-40 reduced charge was finally developed into a "riot" cartridge, its bullet weighing about 170 grains and being made of a rather soft alloy, swaged to shape at the factories. This load did not have the dangerous penetration and range of the full power Krag charge, when employed by troops against limited numbers of the unruly element, in towns. In the Krag it had similar loads made up of 125 and 154-grain bullets, with 10 to 14 grains of Marksman powder, now duPont No. 75, won many a match.

No factory reduced charge ever was available to shooters of the 30-1906 cartridge, but the present Government practice charge, handloaded in barracks, consisting of 10.5 grains of duPont No. 80 powder and a swaged solid alloy bullet of about 140-grains weight, points out the general characteristics of a light 30-06 load widely popular among shooters. Major Whelen's load of the 150-grain or 170 or 180-grain jacketed service bullets and about 16 grains of the same powder or 8 to 10 grains of Unique is even more finely and consistently accurate, and easier. to handload. In addition, midrange charges with gas check bullets or jacketed bullets are widely used.

Reduced loads are those in which the cost, the range, the penetration, the recoil or other features, one or all, are scaled down from the maximum. The object may be to get more shooting for the money available, but this is by no means the only object. We may want a load that is safer to use in settled districts, or indoors, or one that is non-tearing on small game, non-erosive in a fine barrel, non-punishing to shoot.

The owner of a powerful rifle invariably can widen its field of usefullness by providing reduced charges. Its normal energy unfits it for a great deal of desirable and necessary practice and for killing small game. In the big game woods it is really not fit to finish-off a wounded or cornered animal because of its destruction of skin, meat and perhaps a head. The suitable reduced charge is the answer to that problem, and it will provide a shooter with the most of his desired thousand shots per year at a price he can afford to pay.

The one-gun man almost always is a reduced load user. He does not permit his shooting skill to deteriorate through loss of familiarity with his main rifle, as switching to the use of others causes one to do. Instead, he used the powerful rifle for everything, loaded according to the purpose, and in lesser shooting grows more practiced for the fewer important shots.

The ballistic principles stressed in previous chapters of this series govern the assembling of reduced charges, just as they do full normal loads, but many extra bits of information can be applied with advantage. In loading standard full charges, a shooter has only to use standard components and to follow directions exactly. In loading reduced charges he is "on his own." He finds no precise rules. His own knowledge and skill and observation of results must guide the work to a greater extent.

It is easier to prepare successful handloads of this type for box magazine rifles than for those with tubular magazines, since the bullets do not need to sustain the weight of other cartridges and of the magazine spring. It is easier, again, to load for bolt-action rifles than for lever action rifles. The latter often allow more expansion of cases. The 30-1906 cartridge in my own experience has been the easiest one handloaded with reduced charges, while the 45-70 and the 38-55 and other such cartridges have been most of a problem.

All the way through the reloading processes, one finds that the two well developed 30 caliber military cartridges are easiest to handle effectively for this purpose. Their brass cases are thicker and hold their shape and dimensions better in the gun and in the tools. The bullets available are more varied, to suit all conditions. The rifles themselves more accurately conform to standard in barrels and chambers. The odd hunting cartridges, and foreign cartridges, give the most trouble—that is, one has to study and contrive more in loading, and has to seek farther for components that will make reduced loads which are wholly successful for their purposes.

Our tables of loads contain reduced charges for every popular cartridge, and not only that, but give charges representative of each prominent purpose, made up of every suitable powder and every suitable bullet commonly available. Many velocity and pressure figures are given. The Government army practice load, for instance, develops 1100 feet velocity with 7,000 pounds pressure. It is an excellent example of loading to suit a purpose, in this instance a cheap load of restricted range which may be employed for target practice up to 200 yards, with fine accuracy.

The question of purpose is always uppermost in determining on the power of the load. For accuracy at 500 yards, one would hardly choose less power than the equal of a 30-30 full charge, or any velocity below 1500 or 1800 feet for 50-yard or 50-foot target shooting, and for a load to kill animals at the rifle muzzle, the minimum load is best, with a velocity of less than 1000 feet. The requirements for other purposes will be self-evident to handloaders.

After the power or velocity desired is determined upon, a bullet must be selected that is suitable in all ways. For maximum accuracy jacketed bullets usually should be chosen, although no less fine shooting can be obtained from solid bullets if extreme care is taken in their selection, making and loading. For minimum loads, cast bullets with plain bases are most desirable. They may be very light in weight, as for instance, 87 grains in 30 caliber, or may be quite heavy. A weightier bullet often is more desirable than a lighter one, even for minimum charges. The standard bullet of any cartridge, or another of the same weight, can be used for these light loads.

When the power is increased a little, and velocities are pushed above 1250 feet, fusion of alloy bullets by the hot gases becomes a factor, and the use of either jacketed bullets or solid bullets with bases protected with copper gas check cups is necessary. Many shooters have found that the gas check cup bullets are more accurate than plain base bullets. The alloy from which the bullets are cast must be given a suitably high melting point, and must be tough enough to withstand the twist of rifling at the velocity imparted.

Pure lead bullets can be fired with proper smokeless powders in guns with 20-inch or longer twists when the velocities do not exceed 1000 or 1200 feet per second. They will neither fuse nor strip under these conditions. Bullets alloyed equal in toughness to one part tin in fifteen parts lead can be fired without stripping at 1500 feet velocity in 16-inch twist, and sometimes in 12-inch or 14-inch twists, while the same hardness is required for 1000-foot velocities in 10-inch twists. This degree of hardness is about that of the Government 30-1906 reduced load. For velocities of 1200 to 1500 feet in 10-inch twists bullets equal to one part tin in ten parts lead are needed, with a fairly high melting point to prevent fusing, while for higher velocities the hardness should equal one to five to prevent stripping, while only protection of the bases will prevent fusing.

The bullets *must* fit the throat of the particular caliber and the individual rifle you are handloading for. That is one reason why the 30-1906 is an easier cartridge to handload reduced ammunition in than the 30-40. It has a short throat. The need for this fit prevents use of many otherwise proper bullets in many hunting cartridges. Front part of bullets must conform in shape and diameter to the gun chamber, preventing need for the bullet to jump before it engages the rifling. At the least, it must be no smaller than full bore diameter. Much can be done by seating short bullets shallow in case necks, but not always can they be held far enough forward to engage their bearing diameter.

The characteristics of the chambers and throats of different calibers of rifles are too lengthy to describe here, and besides that, they vary in individual rifles. It is safe to say, however, that many handloaders will be surprised when they investigate the inside of their barrels. This always should be done before buying bullet molds or buying bullets, and selection should be made according to the dimensions found. Pay as much attention to the diameter of the bullet's forward portion as to its rearward 'groove" diameter.

A quotation from Dr. Hudson may be in order here. He says, regarding the rear "groove" fit of bullets: " . . . the necessity of using a tight fitting bullet, one that will be absolutely gas tight without any upsetting. There is little or no upsettage with smokeless powder, especially when much air space is used, but if there is the slightest leak past the bullet, these gases from smokeless powder are so intensely hot that they will cut steel like a diamond-pointed tool, deforming both the bullet and the barrel. . . . . The bullet had much better be too tight than too loose, as witness the Cooper bullet . . . .314-inch in diameter, giving fine accuracy in a Krag barrel which to the bottom of the grooves measures only .308-inch."

Seldom can solid alloy bullets of groove diameter or smaller be fired with accuracy. The day for that is passed. With black powder, and nearly pure lead plus heavy crimping, which were the conditions of old-fashioned under-diameter bullets, upsettage could be depended on to produce conditions for more or less accuracy. Our alloy bullets used in modern cartridges, however, are hard. We use the slow-accellerating smokeless powder. We *must* have our alloy bullets larger in the bearing section than the groove diameter by one, two or three thousandths of an inch.

Select jacketed bullets which are full groove diameter. They may be one thousandth of an inch larger without causing trouble.

Handloaders should understand that imperfections and defects in all bullets have greater effect on accuracy in reduced charges than in full power charges. High pressures tend to make bullets conform in size to the barrel, and to flatten their bases, but nothing whatever of this happens in reduced loads. Very true and uniform bullets will shoot in reduced charges with the most extreme accuracy, but bullets even slightly defective, or which do not meet the dimensions of the throat and barrel, will give only fair or poor accuracy. On page 251 of Major Whelen's "The American Rifle," is shown a group made at 50 yards with the 30-1906 Springfield reduced load of 150-grain service bullet and 16 grains of No. 80 powder. It measures just a shade more than half an inch.

Certain of the older "high-power" hunting cartridges still are furnished with sub-caliber bullets. Not all cartridge makers put the bullet out so dimensioned, but some do. These bullets are not suitable for reduced loads. In my own experience, however, whenever the standard jacketed bullet of any of our larger cartridges was of groove diameter, it could be used with 10 to 14 grains of No. 80 powder or with 5 to 8 grains of Unique powder to make an exceptionally satisfactory reduced charge of rather light power. For those cartridges in which the standard bullet is less than groove diameter, a jacketed bullet of another cartridge often can be found and substituted. The weight does not matter greatly, just so the fit is right.

For most cartridges there are excellent molds available, casting heavy bullets of proper dimensions and shapes, and many of these are of the gas check cup type. Now, this type of bullet has a wider field of usefulness than the plain base type. It can be used in loads where its velocity is well up to or beyond

1800 feet when cast hard, or it can be used for very light charges, a purpose for which jacketed bullets are not so good. It is a little more troublesome and a little more expensive to make than plain bullets, but the extra cost is justified for a handloader who does not want to use any jacketed bullets for his reduced charges. Speedy loads with cast bullets are not practicable with plain-base bullets.

Many handloaders object, however, to using the same bullet for different loads. They insist that each loading—light, midrange, heavy, and the like—shall be distinguished at all times by some unmistakeable bullet feature. The Government practice and riot loads when factory produced, in addition to a different bullet from the service one have the front of the case blackened, or rings indented round it. A few handloaders merely employ a different primer, or file notches in the rims of the cases of reduced ammunition, which is hardly enough distinction. Only the veriest beginners fail to distinguish their different loadings at all.

In any event, a handloader should choose his bullets with an eye to this matter of marking the loadings, as well as to suiting the power of the load, the groove diameter of the barrel, and the throat of the chamber. Quite often for reduced charges he will find the bullet intended for his certain cartridge is not as good for use in his particular rifle as some other bullet made originally for another cartridge. If only light charges are to be loaded, plain-base bullets are really as good as the more expensive ones. These considerations constitute the problem in selection of bullets for reduced charges.

Tipping or keyholing of bullets must be considered in connection with the powder charge employed, and the twist of the rifle in which they are shot. We know that a quick twist is required to handle a long bullet point on. Thus the 25-35 rifles with 8-inch or 10-inch twist, will throw a bullet of 117 grains well enough, but the 250 Savage, with its 12-inch or 14-inch twist will not. It is the rate of spin that counts, however, and the faster a bullet is pushed through a barrel, the faster it is made to revolve. The rate of revolution is 150,000, 200,000 or 250,000 per minute with full charge ammunition in modern rifles.

With reduced loads, and lowered velocities, no such rate is obtained, hence the longest bullets may tip or even keyhole. The slower they travel, the less stable they will be, although the proportion of the bullet which bears in the grooves has an influence here. Bullets with long bearing fly point on with less twist than those with short bearing sections, even though of the same overall length and the same weight. Handloaders, therefore, can remedy tipping troubles by increasing the velocity. If that measure results in too much power, a bullet of longer bearing section should be substituted, and if that fails, then a better-balanced bullet, of less weight, should be chosen.

The powder subject was pretty well explained in Chapter 15. For much reduced loads, it is mostly a matter now-a-days of using No. 80, a nitrocelulose powder, or Unique, a nitroglycerine powder. Scheutzen, and No. 1 do not ignite easily enough. They give irregular shooting and hangfires. Lightning and HiVel, two other nitroglycerine powders, and No. 18 and No. 16, nitrocelulose powders, are useful in large cartridges for loads which develop 25,000 to 35,000 pounds pressure. They do not give accuracy, besides producing residues destructive to steel, when used at pressures much lower. For very short range shooting a pistol powder is sometimes used in order to obtain instant and positive ignition of the small bulk of powder in a large case. All the loads are given in the tables. A handloader's problem is to select from such as fits his needs. As an example of powder selection, No. 80 or Unique might be used in the 25-35 or the 30-06 cartridges to develop velocities up to 1700 feet; No. 18 or Lightning for velocities up to 2000 feet; and No. 16 or HiVel for higher velocities.

The conditions of a reduced load are trying from an ignition standpoint, especially when the powder possesses the least reluctance to begin to burn promptly and fully. Primer flame has to stab out through an inch or two inches of empty air, with only its lower edge in contact with the powder, which of course lies in the lower side of the case. Some shooters add filling material to hold the powder back against the primer, but that in effect is adding weight to the bullet, and cuts down the velocity and increasing pressure, hence is never advisable. If fresh primers are used, the flash-holes of the cases are fully open and clean and a proper powder is used, little or none of this trouble will be encountered. Tilting up the gun muzzle just before aiming runs the powder back against the primer, and helps in firing when other conditions are bad.

In nothing else does a rifle show its individual pecularities of boring and chambering so much as when shooting reduced loads. The bullet fit must be correct. *The powder charge must be just right*, and test by shooting is the only way to find out. We often get reports showing that 12 grains or 14 grains of a certain powder in a certain rifle do very well, but that 15 grains give a shade smaller groups; or the figures may be reversed. Furthermore, some rifles will do well with one powder in a reduced charge, but not with another. A handloader must be his own experimenter and judge. He must not be too easily or quickly satisfied.

There is very little expansion of cartridge cases in shooting the lighter reduced loads You never need to resize cases full length for again reloading, provided they fit your rifle chamber at first, and for a tightly throated rifle you do not even need to resize case necks. Cast bullets should be three thousandths of an inch oversize, anyhow, which requires some expansion of case neck to accommodate them without scraping or deforming. For jacketed bullets the necks must be resized regularly. It is desirable to have two sizes of muzzle dies on the job.

Fired cases—cases fired once with the full charge—are better for reduced loads than new cases, and these cases should be fitted in the rifle you will use the reduced ammunition in, to make them conform exactly to *its* chamber. Unexpanded cases are not desirable. Since pressures of reduced charges will not expand new or fully resized cases to fill and seal large chambers, gases escape to the rear in a nasty way, blackening the outsides of the cases and blowing into the face of the shooter, if they do nothing worse. This escape also causes low shots. The fully expanded case centers its bullets more truly in the bore.

Minimum charges in a 30-40 or 30-1906 rifle with 125-grain alloy bullet are about 3.5 grains of Unique or 5 or 6 grains of No. 80 powder. Any jacketed bullet will be surely stuck in the bore by these charges. Charges must be increased 50 per cent. or 75 per cent. for such bullets. In the 25-caliber rifles with 87-grain alloy bullets, as little as two grains of Unique or 4 grains of No. 80 will give twice as much force as we obtain from a 22 Long rifle rim fire cartridge. It is better to stay well above the minimum by using no less than 4.5 or 5 grains of Unique or 9 or 10 grains of No. 80 powder, for if a bullet would stick in the barrel and another be fired against it, serious damage to the barrel would result.

One of the things to learn is to settle, by experimental firing, on the best one, two or three loads for any rifle, serving his one, two or three purposes, and then stick to them, avoiding changes of powder charge or bullet which would call for realigning the sights and cause other complications. Once a shooter adopts a load and learns its sighting and trajectory and other requirements, he can discount all objections. He can do extremely effective work with it. If it is wisely determined upon in all components, no other load will serve its purpose as well.

Everything said in this chapter and in previous chapters, however, shows the necessity for precise selection and assembling of everything—the cases, the primer, the powder, even the metals of the bullets. When a handloader standardizes on any reduced load by trying various combinations and eliminating the poor ones, he works out these problems for that load. When he switches to another load, even by changing powder charge or changing bullet he sets himself back into the unpredictable, and can do effective work with the ammunition only by chance.

In a book called "Rifle-Craft," recently issued, Mr. C. S. Landis has this to say: "The one-gun man and the one-load man is still a hard proposition to beat. The principle advantage of reloading is to find the most effective combination to use in a given weapon. When it is found, it will pay anyone to forget the fifty-seven other varieties that can be loaded and to stick to the one that is uniformly satisfactory."

Mr. Landis once had an article in this magazine on the subject of making squirrel rifle out of the Springfield 30-1906. He employed 15 grains of No. 80 powder and the 150-grain service bullet, among other loads. In the article he emphasized the variation in striking point between full power and reduced loads

by explaining that his reduced load at 50 yards took about the same elevation as the full power load at 600 yards. "The ten shots printed on the lower edge of the 4-inch bull; eight of the hits in one ragged gash," he said, when his sights were adjusted.

That different striking point is an undesirable but inevitable feature of reduced loads—inevitable in most rifles. Heavy-barrelled rifles, such as the No. 3 barrelled single shots, Winchester Model 95 and 86 in big bores, sometimes will shoot light loads at 25 or 50 yards with the same sight adjustment required for full charge loads at 100 yards, but such rifles are the exception. Usually, as with the Springfield above noted, far more elevation is required, amounting to 500 or 600 yards on military sights, or to several step-up notches on common gun-factory hunting sights, or rear peep sight stems. It is the rule rather than the exception, also, to find the reduced-load bullets striking off to one side or the other. It is not always the same side. In the same gun, a load of one power will sometimes shoot to the left two or three inches at 50 yards, while a load of another power will shoot an equal distance to the right.

For these reasons, reduced charges are used most successfully in rifles having a complete sight equipment. Screw windage adjustment is as important as ready elevation. It is practicable, but not sure or convenient, to use reduced charges without changing sights in any rifle, by learning the location of the striking point and holding over to a side and above the point desired to be hit; but this is possible only at shortest ranges.

As a good illustration of the purposes served by reduced loads, we may quote Chauncey Thomas in June 1923 "Outdoor Life" magazine He was writing of his 30-40 rifle, and for it selected the 125-grain grooved bullet and the 200-grain gas check bullet as the most convenient to him. He says "The smaller one gave results about like the 25-20, and the larger bullet results about like the 32-40, and accuracy equal to cast bullets out of either of these justly famous accurate sizes in low-power rifles. But this gives me three guns in one—30-40 Krag, 32-40 and 25-20, practically speaking, without any loss in accuracy."

The essential point is that a shooter can use the one rifle, and can realize all the advantages in becoming thoroughly familiar with it, doing a great deal of his shooting with what is a light, small cartridge, but in an instant when needed, he can throw in a powerful cartridge. A handloader can duplicate any light cartridge in any larger one.

In our powder chapter we brought out the fact that reduced loads offer the opportunity of securing finer accuracy so far as the powder is concerned, by burning it more completely and uniformly than is sometimes possible in heavy loads. The feature should be emphasized here. What we do is to burn a fast powder at a pressure well up to its maximum limit, but still well within the limit—while remaining easily within the limits of the gun and case. The extreme accuracy obtained when perfect bullets are used is proof of the advantage. The two outstanding examples of accurate reduced loads, 30-1906 and 250-3000 Savage with this regular jacketed bullets and No. 80 powder, will make half-inch groups at 50 yards.

It may be ticklish business to try handloading charges above normal full charges, even when feeling one's way a grain of powder at a time. But there is no danger in reduced loads, so long as a handloader does not get two charges of powder in a case together. Pressures are always lower than standard.

Most shooters are familiar with the ringed necks of cases of 30-30 short range, and of various small cartridges, the ring being what prevents the bullets from going back too far into the cases. Handloaders will do well to avoid these cases for their own use, with full or reduced charges, as they cause various complications.

The ways to prevent bullets from receding too far into cases are three. The best is to have the case neck just small enough to grip the bullet firmly, holding it by friction. Such holding gives greatest accuracy in most cartridges, and is sufficient in box-magazine guns for this purpose. A second way, necessary for ammunition to be used in tubular magazines in connection with having the case neck a snug, firm fit, is to crimp the mouth of the case into a groove on the bullet, and this combination when well executed will hold any bullet in any gun.

A third way which is useful when crimping is undesirable, is to indent the case neck lightly with some dull pointed instrument at two or three positions, thus raising obstructions on the inside. The "Ideal Shell Indentor" is made for that purpose. If attempted by hand, the inside of the case neck must be supported fully and uniformly, and the case must not be punctured. Plain-base lead and alloy bullets are made to shoot inaccurately by this loading, hence the plan is useful only with jacketed bullets and gas check bullets. Furthermore, bullets shorter than normal are the only ones with which this plan can be used, since part of the case neck is taken up by the indentures. Usually it is best to rely on holding bullets friction tight by means of careful resizing, or on this and crimping.

In conclusion, much more could be written on this interesting subject of reduced loads, but the object is to give the ground work briefly, and leave the side issues to current magazines. Shotgun powders and other rifle powders than those named are often used, but they are not as good as the ones specified. The powder chapter tells why. For extremely light charges, round balls can be used with fair accuracy if they are cast hard and seated right, but they are not as good as proper grooved bullets or jacketed bullets. A handloader has the world before him in this field The cartridge factories offer little or no ammunition to compete or compare in this class.

Wartime Cartridge Cases - A Caution

WE have often had to caution American riflemen against the use of cartridge cases made during the war, particularly for maximum loads. During the past year we have had so many complaints from riflemen using such cases, and have heard of so many serious accidents resulting from their use that the time has come to most emphatically caution riflemen against their use for anything but reduced loads, and for these only when the case shows no signs of cracks in the neck. Brass deteriorates from age. These war time cases, none too good at the start, have now deteriorated to the point where it is no longer safe to use them with any full loads.

Cartridge cases require the very best grade of brass for their proper construction. During the war there was naturally a very general deterioration in the quality of the brass available. In addition to this not so much attention could be given to the proper annealing of the cases made in such large quantities and in the great rush of war production. Also most of the .30 caliber Model 1906 cases were made with the so-called "machine gun anneal" so as to work more efficiently in machine guns without rupturing and causing jams. One of the troubles with war time cartridge cases is that they are too soft, they will not stand high pressures, the heads expand, allow the primers to blow out, stick badly so that they are hard to extract, and a certain proportion of such cases when used with high velocity loads give away at the head, allow the gas to come back, completely wrecking the breech mechanism of the rifle, and often seriously injuring the shooter. Other cases split at the neck and badly score the chamber of the rifle. In no case will they give satisfaction, and we believe that they are now absolutely dangerous to use. This applies to all .30-Model 1906 and .30-40 Krag cases made by the Government and by all private cartridge companies prior to 1921. It may also apply sometimes to cases of other calibers made prior to 1920.

War time cases for the .30 Model 1906 cartridge and the .30-40 Krag cartridge can be told from peace time commercially made cases by the fact that the former have only the initials of the manufacturing company, and the month and year of manufacture stamped on the head, while the good commercial cases have the initials of the company and the name of the cartridge stamped on the head. The proper Frankford Arsenal cases for use with high velocity and maximum loads have "F. A. 22-R," or "F. A. 23-R," stamped on the head, the numbers signifying the year of manufacture, and the letter "R" standing for "rifle anneal" as distinct from "Machine gun anneal."

The undersigned believe it highly desirable that the utmost publicity be given to this caution.

J. R. Mattern

Townsend Whelen

Individual Instruction in Rifle Practice

By Col. A. J. Macnab, U. S. A.

Part 5

SECTION IX

Gallery Practice.

55. *Object.*—Gallery practice represents the application with gallery ammunition of the principles taught in the preparatory exercises. When the rifle range is conveniently situated and the ammunition allowance is plentiful, gallery practice may be omitted. However, gallery practice may be carried on within the post or camp at times when the range is not available. By giving the individual an object lesson of his progress, gallery practice provides a means for sustaining interest in preparatory instruction before going on the range. Gallery practice enables the company commander to visualize the state of training of his command and to concentrate his efforts on the training of those who are most deficient.

56. *Value.*—The chief value of gallery practice lies in the fact that it is convenient, interest sustaining and economical. It does not have the value of range practice because of the absence of recoil, but on account of its convenience and the saving in the cost of ammunition, the organization commander will sometimes find that gallery practice is a valuable step between preparatory instruction and range practice.

57. *Gallery course.*—No gallery course is prescribed. At the discretion of the organization commander it may include firing from all positions and all classes of fire, using targets appropriate to the ranges and classes of fire. Gallery practice may be with the service rifle using reduced-load ammunition or with small-bore rifles and ammunition.

58. *Continuous gallery practice.*—Gallery practice may be carried on throughout the year subject to such limitation as may be imposed by the allowance of ammunition. Organized gallery practice preceding range practice will be conducted in accordance with methods of instruction as prescribed in these training regulations. Continuous gallery practice will be properly supervised and controlled. All persons who have never been properly instructed in shooting methods prescribed herein will be given a course of preparatory instruction before being permitted to fire on the gallery range, and will be coached during the firing of their first 100 rounds.

SECTION X

Range Practice.

59. *General principles.*—Range practice is divided into two parts: *a. Instruction practice* which represents the application with service ammunition of the principles taught in the preparatory exercises. During instruction practice the soldier works under the supervision of a coach. The coaching methods prescribed in this section apply to instruction practice only.

b. Record practice, in which the soldier fires for qualification as a test of his ability as a rifleman. Coaching is prohibited during the firing of record practice.

60. *Importance of correct trigger squeeze. a.* Any man who is physically fit to be a soldier and who has had a proper course of preparatory instruction can aim and hold well enough to make a score of over 40. Scores that are under 40 are nearly always due to pressing the trigger incorrectly. The coach therefore will concentrate his attention on the trigger squeeze. He, of course, checks the position, the aiming, and the holding of the breath from time to time to see that the instruction on these points has not been forgotten, but by far the greatest amount of the coach's time will be devoted to requiring the pupil who is firing to press the trigger so steadily as not to know exactly when the discharge will take place.

b. It can always be proven to the pupil that he will be a good shot as soon as he learns to press the trigger properly, by having the coach press the trigger while the man under instruction holds and tims the rifle, as described in paragraph 68. Shots fired in this way from either the sand-bag rest position or the prone position are almost always well placed. This is a very valuable method of coaching poor shots and is often a means of improving the scores of men who are classed as good shots.

61. *Order of firing.*—The instruction practice firing should begin as prescribed in the tables outlining each course (see T. R. No. 150-10). These tables are made to fit the usual case, but organization commanders are not required to adhere rigidly to them when special circumstances make it advisable to modify the procedure in order to take the best advantage of the time and ammunition and the range facilities available. The general plan of beginning with slow fire in the sand-bag rest position and following with slow fire in the prone position without the sand-bag will be adhered to.

62. *Object of sand-bag rest.*—The sand-bag rest is used at the beginning of the course, not to teach steadiness of hold but to facilitate instruction in the proper method of pressing the trigger. The sand-bag assures such a steady hold that the temptation to the beginner to snap in his shot at the instant the sight touches or drifts past the bull's-eye, which is the cause of nearly all poor shooting, is eliminated. With the sand-bag rest the sights can be held fixed at the bottom edge of the bull's-eye while the firer squeezes the trigger with such a steady pressure as not to know exactly when the rifle will go off, which is the basis of all good shooting. The habit of correct trigger squeeze, having been acquired by firing with a sand-bag rest, will, in all probability, be retained while firing prone and in the more unsteady positions, sitting, kneeling, and standing.

63. *Pads.*—Men will be required to wear pads on the shoulder, and if the ground is hard, on the elbows for the first three or four days at least. A pad can easily be improvised by putting a pair of woolen socks under the coat or shirt so as to protect the shoulder and the upper muscles of the arm. After a few days of firing the muscles become hardened so that the pads are not essential, but it is advisable to wear them throughout the entire period of range practice.

64. *Coaching. a.* During instruction practice each man on the firing line will have a coach watch him and to help him correct errors. This statement does not mean that each man must have an old or experienced shot beside him. Any man of good intelligence who has been properly instructed in the preparatory work and who has been given instruction in coaching methods can be used with good results and should be used when more experienced coaches are not available.

b. It is good practice to have expert coaches in charge of one or more targets, usually on the flank, to which particularly difficult pupils are sent for special coaching.

c. Great patience should be exercised by the coach so as not to excite or confuse the firer. Everything should be done to encourage him. It is often a good plan to change coaches. It is necessary to do so when the coach shows signs of reaching the limit of his patience.

65. *Position of coach.*—The coach will take the same position as the man who is firing—prone, sitting, kneeling, or standing—so as to be able to watch his trigger finger and his eye.

66. *Watching the eye.*—Errors in trigger squeeze, which are the most serious and the hardest to correct, can be detected by watching the pupil's eye. If his eye can be seen to close as the rifle goes off, it is because he knew when it was going off and consequently was not squeezing the trigger properly. The explosion and the shock will cause a man to wink, but this wink can not be seen, due to the sudden movement of the head that takes place at the same time. If the firer can be seen to wink, it is because he winked first and jerked the trigger afterwards.

67. *Use of dummy cartridges in slow fire.*—If the pupil is seen to be flinching or if he is doing poor or mediocre shooting, the coach first checks his aim by the aiming device. Having assured himself that the pupil is aiming correctly, the coach has him turn his

Plate No. 17.

Position of coach

head aside while he, the coach, puts in a cartridge and shoves the bolt home. Occssionally the coach loads in a dummy cartridge instead of a live one without letting the pupil know what he has done. Then the flinch, indicated by the shoulder being shoved forward at the same time that the trigger is pressed, will be evident even to the firer himself. The coach then proves to him, by squeezing the trigger a few times, as explained in the next paragraph, that his poor shooting is due to faulty trigger squeeze.

68. *Coach squeezing the trigger.—a.* To queeze the trigger for the firer, the coach lies with his right elbow on the ground to steary his hand, places his thumb against the trigger and his first finger against the back of the trigger guard. In this way he can apply pressure to the trigger by a pinching action of his thumb and first finger.

b. The coach then watches the firer's back, and between 5 and 10 seconds after the firer begins to hold his breath he applies enough pressure to discharge the piece. Shots fired in this way are almost always accurately placed. After discharging the piece a few times the coach lets the firer try a few shots alone to see if he can press the trigger the same way the coach pressed it, so as not to know just when the rifle will go off. Sometimes it is necessary to repeat this exercise, but the majority of beginners can be permanently cured of the tendency to flinch by a few minutes of this kind of coaching. Old shots who are flinchers require more time and patience.

69. *Duties of the coach in slow fire.—a.* The coach observes the pupil carefully and corrects all errors. He pays particular attention to the following points:

(1) That the sights are blackened and that they are set at the proper range.

(2) That the ammunition is free from dirt.

(3) That the pupil has the correct position, gun sling properly adjusted, body at the proper angle, elbows correctly placed and cheek pressed firmly against the stock.

(4) That the magazine is loaded from a clip in the correct manner.

(5) That the slack is taken up promptly.

(6) Whether or not the pupil flinches (by watching his eye).

(7) That the pupil calls his shot each time he fires.

(8) That the pupil keeps his score book correctly.

(9) That the pupil is holding his breath properly (by watching his back occasionally).

(10) That the aiming is correct (by watching through the aiming device occasionally).

b. When necessary, the coach applies the coaching methods described in paragraphs 67 and 68.

70. *Final precautions for slow fire.*—The following precautions should be read over each time before going to the firing point. They will be read by the instructor to the assembled pupils at the beginning of instruction and record practice:

a. Be sure both the front and rear sights of your rifle are properly blackened.

b. Take your score book to the firing point and obtain your elevation and windage from it for the first shot.

c. Fire your first shot very carefully and then, if necessary, change the sights to bring the second shot into the bull's-eye.

d. Always aim at the bottom edge of the bull's-eye for all shots.

e. Never try to make a bullet hit closer to the bull's-eye by changing the aiming point. When you wish to change the hitting place of the bullet, do so by changing your rear sight.

f. Do not change your windage until you have looked at your score book to find out how much of a change you need; then look at your wind gauge to see how much windage you have before you start to make the change.

g. Plot all of your shots in the score book. Watch the score book to see where your group is going. Try to bring the center of the group to the center of the bull's-eye by making the necessary change in your sight setting.

h. Do not change your sights unnecessarily. If you have made two or three good shots and then make a bad one, do not change your sights on account of the bad one because it is almost certain that it is your own fault.

71. *Importance of rapid-fire training.*—The true value of a soldier as a rifle shot depends upon his ability to deliver rapid fire, or more properly speaking, continuous fire, accurately. The tendency to jerk the trigger, and consequently to flinch, is very strong in rapid fire. This tendency must be corrected before it can become a fixed habit. Constant vigilance and absolute attention to every detail by the coach is an absolute requisite.

72. *Use of dummy cartridge in rapid fire.* *a.* The tendency to flinch is eliminated by using clips in which half the cartridges are range dummy. The dummy and live cartridges are put into the clips by the coach in such a way that the pupil can not know which will go off and which will not. Then if he is not squeezing the trigger with a steady pressure he will flinch, or shove the shoulder forward to meet the shock, when there is a dummy in the chamber and no shock occurs. The flinch is then apparent to the coach and to everyone in the vicinity, including the man doing the flinching. The result is that he makes a determined effort to squeeze the trigger with a steady pressure for all shots so as not to appear foolish both to the observers and to himself. During this kind of practice the coach must watch the firer closely to see that he does not look into the chamber in an attempt to see which cartridges are loaded and which are dummies. If he is allowed to look into the chamber while working the bolt, the value of the practice is lost and a very bad shooting

Plate No. 18.

Coach squeezing trigger

habit is acquired.

b. Range dummy cartridges, very similar in appearance to the service ammunition are issued by the Ordnance Department for this purpose. They are issued to use on the rifle range with loaded cartridges, and this is the only use of them which is permitted. Practice dummy cartridges of such shape and color as to be readily distinguished from the service cartridge must be used in all other exercises requiring the use of dummy cartridges.

c. It is advisable to have each order, when it comes to the firing point, simulate a score of rapid fire, using dummy cartridges or having the cut-off turned down.
that they are set at the proper range.

(2) That the gun sling is properly adjusted.

(3) That the pupil assumes the correct

73. *Use of spotters in rapid fire.*—Spotters will be used in rapid fire. When the target is run up to be marked, with a spotter on each shot hole, a picture of the group is obtained immediately. If enough issue spotters for this purpose are not available, each organization commander will have enough made for his organization. Spotters can be made out of cardboard and ordinary bailing wire. A tin spotter can also be made out of the tops of small cans.

74. *Duties of the coach in rapid fire. a.* The coach observes the pupil carefully and corrects all errors. He pays particular attention to the following points:

(1) That the sights are blackened and position.

(4) That he takes up the slack promptly.

(5) Whether or not the pupil flinches (by watching his eye).

(6) That he works the bolt rapidly.

(7) That, while working the bolt, the pupil keeps his eye on the target, the rifle to his shoulder and his elbows in place.

(8) That he reloads the magazine from a clip properly and quickly.

b. These operations follow each other and the coach can watch each in turn. The coach will also, at times, watch the pupil's back to see if he holds his breath while firing each shot. In the case of a difficult pupil, it is advisable to have two coaches watching him fire.

c. Any lack of a smooth and rapid bolt operation indicates that the preparatory training has not been sufficient and additional rapid-fire practice will be given.

75. *Final word.*—Good shooting is a matter of instruction and not of more practice. It requires no inborn talent. If the instruction is good the shooting will be good. Practice without the proper instruction will produce only a small percentage of good shots, and those only after they have learned by long experience what they should have been taught in the beginning.

76. *Basis of comparison.*—In competitions between organizations and in making a comparison as to relative results obtained in target practice, the basis of comparison should be the average score per man.

Spotting Scope Dope

(*Continued from page 3*)

the resolving power of the objective, no image will be formed which can be magnified and seen.

The resolving power of an objective readily can be calculated by dividing 4.56 seconds by the diameter of the objective. This gives a result which is theoretically possible only, as no account is taken of atmospheric disturbances or imperfections in the surfaces of the glass of the lenses.

In astronomical observations, where stars are observed directly overhead, we are looking through the shortest possible path through the atmosphere and it is possible to reach the theoretical limit when the atmospheric conditions are excellent. But in observing upon a rifle range, we are observing under the worst jossible conditions; that is, directly along the ground, where we get the full effect of ground radiations, of heat, mirage, dust and steaming vegetation. It is like trying to read a newspaper across the room with an opera glass, with a good hot stove between the observer and the paper.

In designing a telescope for observing on the range, a very liberal factor must be alowed in the resolving power to compensate for these disturbances.

Next to the resolving power of an objective the illumination is very important. This is directly in proportion to the area of the objective; the larger the objective the higher the illumination. A fairly large objective of short focus is highly desirable for this type of work.

In observing upon a rifle range, the mirage is a most disturbing element and should be taken into account when designing such a telescope. In all astronomical observations it is the rule to use the lowest possible power which will show the detail sought for, as the results of atmospheric disturbances are less with the low powers and the illumination is higher. The higher the power, the larger the image, but the illumination will be much inferior, and the unsteadiness of the image, due to atmospheric tremors may be such that you cannot see the fine details which were so readily visible with the lower power and brighter and steadier image.

Just so in range telescopes, it is necessary to keep down magnification as low as possible and to obtain greater visual acuity by increased resolving power, which you can obtain only by increasing the diameter of the objective. Thus a three inch objective, with an eye-piece to magnify 25 will show .30 calibre bullet holes at 1000 yards, where a smaller objective will not show it with any magnification, however high. Taking two telescopes, one with a 2 inch diameter objective and magnification of 25, the other with a 3 inch objective and same magnification, the larger glass will show the same objects 50 per cent. farther than the smaller one, although both have the same magnification. This is the direct benefit of increased resolving power and increased illumination.

For outdoor range work, magnifications of from 10 to 20 per inch of diameter of the objective, work very satisfactorily. Higher magnifications can be used on special occasions, where atmospheric conditions are of the very best, but for all-round work the lower magnifications are the more suitable.

The foregoing is all upon the assumption that the optical parts are theoretically perfect. A perfect optical system, however, is not possible. In every optical system there are a series of residual errors, the chief of which are spherical and color error, curvature of field, and distortion. By proper design in high grade instruments, these errors are reduced to the point where their effect is not detrimental upon the final image. In many of the cheaper foreign scopes there is consider able color error, also a general bluish haze over the entire field. This is partly caused by poor choice of glass and poor workmanship in polishing the objective. Nothing is so detrimental to fine definition as poorly polished surfaces, and surfaces which are not optically true. The errors in the curvature of the surfaces are generally so small that they cannot be measured by mechanical means, yet a very minute error in curvature produces large defects in the image. In order to get the very finest possible image, the objective should be hand corrected after it comes from the polishing machine. By the proper correction of the surfaces of an objective, it is possible to compensate residual errors which could not be eliminated by any method of machine polishing. All astronomical objectives are finished by hand so as to stand up to the full limit of 100 magnification for every inch diameter of objective.

When purchasing a telescope, always get as large an objective as you can, and be sure it is good. If in doubt, try it on several different ranges, and see if it shows a clear, distinct image of the target and the rings. Don't try to buy the highest magnification you can get, for you will be much disappointed. What you want is plenty of illumination, for you will need it on those dark, cloudy days. Remember also that a good telescope calls for considerable skill and patience to make, so *don't buy the cheapest kind.* The cheap foreign glasses which are imported for $5.00 or $10.00 are made in large quantities and cannot give you the performance you need. Quality objectives cannot be turned out at the same rate as spectacle lenses, any more than fine hand made match rifles can be made by the thousand by automatic machinery.

Early Days of the Free Rifle

(Continued from page 2)

1895 and June 1901. H. L. Willard made three, Mrs. E. E. Patridge two, and W. P. Thompson one. Occasional possibles were made on other ranges.

This rest shooting by Mrs. Patridge was very likely as accurate rifle shooting as has ever been done by an American woman. Two 10-shot possible scores at 200 yards on a center less than 1½ inches in diameter requires unusual holding, and every bit as much skill as the making of a good prone score.

Mr. Francis J. Rabbeth of Massachusetts had one run of fourteen consecutive 12's and also a run of 70 consecutive shots in the 3-36/100 inch 10 ring—rest shooting. This was done with a .38 caliber Winchester barrel cut with twelve grooves.

Mr. Chase of Massachusetts, also a very well-known shooter, had a run of thirty-two consecutive 10's, shooting from rest.

Scores of 119 x 120 for ten shots on the 1.41 inch, 12 center were made by a good many shooters while scores of 115 to 117 x 120, an average of over 11½, were very common. The degree of accuracy required to get a score of 120 may be estimated by remembering that this is at least three times as difficult as making a 10-shot possible on the 100-yard small-bore target that we now use, if we want something difficult to shoot at.

Many others shot for group only and not for score. Groups the size of the 12 ring or less were made with reasonable frequency, and once Miss Minnie Schenck, a young woman in Williamsport, Pa., made two such groups in succession.

Exceptionally high scores were also made offhand on the standard American target. Ten shot scores of 98 were occasionally made. I know of two on record. Dr. Hudson had a record score of 462 (average 92.4) for fifty shots by 1901, and a 100-shot score of 900 in 1902. D. W. King, of Denver, Colorado, made a new record of 917 x 100 and 98 of these shots, if I recall correctly, were within the 11 inch bullseye.

If any competitor at Camp Perry would score 98 bullseyes, out of 100 consecutive shots offhand, on a 10 or 11 inch military bull at 200 yards nowadays, not only the shooter but also most of the spectators would have heart failure. Most of us simply don't know how to shoot offhand. At Springfield, Mass., April 9, 1904, H. M. Pope equalled King's record score of 917. To do it he made five consecutive 10's on the 3-1/3 inch center on his last five shots and these included two inside the 12 ring, two in the 11, and one in the 10. All of the 100 shots were in the 11 inch black and 94 of them were in the 8 inch 8 ring. In offhand shooting 12's, 11's, and 10's all count 10.

"Shooting and Fishing" has this information to offer about Pope's offhand scores up to 1904 *only:*

"This gentleman's record includes six scores of 97 and twenty-one of 96 on the standard American target, 237 in ten shots, also ten, three-shot scores of 74 x 75 on the German ring target—all offhand at 200 yards." In Pope's 100-shot record his highest score (the last) was 95 and the lowest 89. King had a 97 in his 100-shot world's record.

The 10 ring of the standard American target, if enlarged in proportion to be used at 300 metres or 329 yards, would be 5.52 inches in diameter. The 10 ring of the present international target is approximately 4.00 inches in diameter and is, therefore, harder to hit, but we must remember that there is *very much less* wind drift at 329 yards with a 180 grain bullet at 2650 foot seconds muzzle velocity than there was at 200 yards with a 180 grain bullet of about the same caliber at 1400 foot seconds muzzle velocity. So much so, in fact, that the offhand scores should not be so very much different if we had the same number of high class shots now as we had twenty years ago.

Some people are inclined to knock Schuetzen shooting because the competitors were frequently of German extraction but that had nothing to do with scores or the desirability of offhand shooting as an American sport.

The 300 metre range is a decidedly difficult problem from a ballistic standpoint than the 200 yard range, and it is undoubtedly true that the modern high-power match rifle is superior to the low velocity Schuetzen rifle at this distance. Otherwise the Swiss would be using different equipment. But this difference may not be as great as many suppose. The skill in offhand holding required for one is nearly the same as for the other, and the old time scores are a real indication of what might be possible now—if we had *enough* good offhand shooters.

One of our most expert ballistic engineers, and one who has tested more Springfield match ammunition from Mann V and machine rests, than probably any other man living—and who incidentally was a fine Schuetzen shooter in the old days—says that in his opinion the best modern .30 cal. ammunition will average probably ¼ or ½ smaller groups at 300 metres than the old Schuetzen rifles, but that this is due principally to its better wind-bucking qualities. Six inches to a foot of wind drift was not at all uncommon at 200 yards on the Schuetzen ranges, and this, in itself, will make a very noticeable difference in the size of the groups.

The kind of offhand holding that will enable a man to occasionally score a 48 or a 50 and to average 44 or 45 on the 10 inch bull of the target at 200 yards will generally be a couple of miles short of scoring 96 or 97 on the 3-1/3 inch center of the standard American target—a score that was often made with a low-velocity Schuetzen rifle.

If we had several dozen, or better still several hundred men, who could make average offhand scores of around 85 at 300 metres, then we would occasionally find enough men shooting an offhand average of about 87 to 90, for 40 shots, to give us an International free rifle team that would be on a par with what we could probably have turned out in the old days, if the old-time shooters had possessed a perfectly possible refinement of modern equipment and had done their shooting at 300 metres.

As Major Waller says—"What we need is offhand shots." Not two dozen good shots, as there now are, but several hundred with the skill and enthusiasm of the Schuetzen experts of 1900. If they were armed with the kind of equipment that would be possible were our high-power, heavy-barrelled match rifles refined to the point that the Schuetzen rifles reached nearly a generation ago such an aggregation could produce international teams that would give us the same superiority in offhand shooting that our previous teams have demonstrated when shooting prone.

R. O. T. C. Matches

SEVENTY-NINE R. O. T. C. Units representing 77 institutions of learning throughout the United States participated in the second National R. O. T. C. Gallery Competitions.

Thirty-eight Major Colleges and Universities were represented.

The match is divided into three groups: First, the Senior Units representing the colleges and universities; second, the Junior Group representing high schools and military schools, and, third, the group for Government-aided schools.

The University of Wisconsin with an aggregate score of 5,851 for the six weeks' firing in all four positions won the senior group match. The University of Minnesota was runner-up with 5,792 and the Pennsylvania State College with 5,747 was third.

The Oakland, California, High Schools took the Junior Group into camp with a total of 5,850. Fremont, California, was second with 5,848, and Northern High School of Detroit, Michigan, third with 4,806. The Washington, D. C., High School Cadet Brigade led the lot of Government-aided schools with an aggregate of 5,413, Chatham, Virginia, Training School being second with 5,306.

The interest in rifle shooting which the R. O. T. C. is stimulating through these matches in the various High Schools and colleges throughout the country will, within the next few years, prove invaluable to the progress of the game and civilian riflemen should, whenever possible, assist the Professors of Military Science and Tactics in instructing the students in the rudiments of rifle practice and in the benefits of firing under match conditions. The National R. O. T. C. Competition is fired with the Winchester .22 musket as issued but there is no reason why every R. O. T. C. unit should not affiliate with the National Rifle Association and obtain the benefit of competition in the National Intercollegiate or National High School Championship Matches, as well as learning how to shoot with more modern rifles and the more accurate .22 calibre long rifle cartridge.

Eyes and Marksmanship

(Continued from page 9)

is to 354, or practically the same ratio as is shown in Table 1 among the *white* soldiers qualifying in marksmanship.

Color of Eyes in Relation to Character of Qualification in Marksmanship

Table 2 consists of two sections, Part I being for white troops and Part II for Whites and Negroes combined. This table was prepared to show what influence the color of eyes might have upon the ability to qualify in the higher grades of marksmanship. From the figures showing the distribution per 1,000 of those who qualified, it is apparent that there is no difference in the ability of white men with blue or brown eyes to attain the highest grade (expert riflemen), the number for each being practically the same, 82.01 and 81.28. It appears, however, that there is a slight difference in the relative number who qualified as sharpshooters and as marksmen, more blue-eyed men qualifying as sharpshooters and more brown-eyed men as marksmen. This latter result is probably, however, due more to race than to color of eyes; thus nearly three-fourths of the brown-eyed Italians who qualified reached only the grade of marksmen (see Table 8).

Practically the same information for the White and Negro troops combined appears in Part II. Although the results shown are quite similar to those in Part I, it is, however, apparent that here the relative number of brown-eyed men who qualified as sharpshooters was increased, but that a smaller number qualified as expert riflemen. This was probably due to including the brown-eyed Negroes, of whom relatively a greater number qualified as sharpshooters, but a smaller number as expert riflemen, which is apparent from Table 3.

Race in Relation to the Character of Qualification

From the distribution in Section B of Table 3, it is apparent that a larger number of Whites qualified as expert riflemen and as marksmen, while a much greater number of Negroes qualified as sharpshooters. In this connection it may be of interest to know what proportion of the men who were in the military service qualified in any one, or in all three of the grades. To obtain an approximation of the number who were in the Army, the mean strength as published in the Annual Reports of the Surgeon General (3), for the years 1910, 1911, 1912, and 1920, was taken (the year 1919 being excluded, due to the inclusion during that period of a large part of the war army which was demobilized during the year). The aggregate strength for the Whites was 389,505, and for the Negroes 19,386. Dividing each of these aggregates by 4, in order to reach an average figure approximating a one year's strength, we obtained for the Whites, 97,376, and for the Negroes, 4,847. By the use of these strengths, as the measure of the average number who were in the military service, the ratios in Section C were computed. It appears that a greater number of Negroes than Whites qualified, the relative number being 63.96 and 52.23. From these ratios in Section C it is again obvious that relatively more Whites qualified as expert riflemen, and more Negroes as sharpshooters. To what extent the larger number of expert riflemen among the White troops was due to the inclusion of the commissioned officers and of the non-commissioned officers of the higher grades, a larger percentage of whom were Whites, may possibly be determined from Table 4. In like manner, to what extent the greater relative number of sharpshooters among the Negro troops was due to the longer service of the Negroes may possibly be determined from Table 5.

Military Rank in Relation to Character of Qualification

It is apparent from Table 4 that one-third of all of the officers who qualified did so as expert riflemen, an additional one-third qualifying as sharpshooters. On the other hand, approximately only one-ninth of the non-commissioned officers qualified as expert riflemen, and one-twentieth of the privates. We see furthermore that twice as many non-commissioned officers as privates qualified as expert riflemen, but a larger number of privates qualified as sharpshooters and marksmen, due here to the larger number of non-commissioned officers qualifying in the highest grade. It can be seen from these data how much the inclusion of a larger percentage of officers and non-commissioned officers with the Whites would modify the results of comparison by race, as set forth in Table 3.

Length of Service in Relation to Character of Qualification

Table 5 shows the regularly progressive effect which length of service had upon the ability of men, who qualified in marksmanship, to display the highest skill (expert riflemen). Thus only 36 of each 1,000 men who qualified with less than one year's service attained the grade of expert riflemen, whereas 139 of those who had over ten years' service did so. From the data which are available it is not apparent why a relatively larger number of men with one year's service (less than two years' service) qualified as sharpshooters than was the case with men of two or three years' service. Possibly the explanation may be that those with natural ability qualified as sharpshooters early in their military service, whereas those who lacked natural ability and who consequently required more instruction attained the higher degree of proficiency at a later date.

From information published in the Annual Reports of the Surgeon General (3) for the years 1910, 1911, and 1912, it ap-

TABLE 2.—CHARACTER OF QUALIFICATION BY COLOR OF EYES[3]

Eye color	Absolute numbers				Distribution per 1,000		
	E.R.	S.S.	M.M.	Total	E.R.	S.S.	
Part I—Whites only							
Blues	273	1,468	1,588	3,329	82.01	440.97	477.02
Browns	152	762	956	1,870	81.28	407.49	511.23
Total	425	2,230	2,544	5,199	81.75	428.93	489.32
Part II—Whites and Negroes Combined							
Blues	276	1,468	1,593	3,337	82.71	439.92	477.37
Browns	166	924	1,081	2,171	77.46	425.61	497.92
Total	442	2,392	2,674	5,508	80.24	434.28	485.48

TABLE 3.—CHARACTER OF QUALIFICATION BY RACE

Race	Section A Absolute numbers				Section B Distribution per 1,000			Section C Ratios per 1,000 men in the Army			
	E.R.	S.S.	M.M.	Total	E.R.	S.S.	M.M.	E.R.	S.S.	M.M.	Total
White	426	2217	2540	5183	82.20	427.75	490.06	4.37	22.77	26.08	53.33
Colored	16	164	130	310	51.61	529.03	419.35	3.30	33.84	26.82	63.96
Total	442	2381	2670	5493	80.47	433.46	486.08	4.32	23.30	26.02	53.74

TABLE 4.—CHARACTER OF QUALIFICATION BY RANK

Rank	Absolute numbers				Distribution per 1,000		
	E.R.	S.S.	M.M.	Total	E.R.	S.S.	M.M.
Officers	10	10	10	30	333.33	333.33	333.33
Non commissioned officers	275	1,003	1,118	2,396	114.77	418.61	466.61
Privates	160	1,384	1,567	3,111	51.43	444.87	503.70
Total	445	2,397	2,695	5,537	80.37	432.90	486.72

TABLE 5.—CHARACTER OF QUALIFICATION BY LENGTH OF SERVICE

Length of service	Absolute numbers				Distribution per 1,000		
	E.R.	S.S.	M.M.	Total	E.R.	S.S.	M.M.
1 year	37	448	527	1,012	36.56	442.69	520.75
2 years	27	192	345	564	47.87	340.43	611.70
3 years	46	337	552	935	49.20	360.43	590.37
4 years	47	325	278	650	72.31	500.00	427.69
5 to 9 years	132	563	539	1,234	106.97	456.24	436.79
10 and over	153	523	423	1,099	139.21	475.89	384.89
Total	442	2,388	2,664	5,494	80.45	434.66	484.89

[4] E.R. signifies expert rifleman; S.S. signifies sharpshooter; M.M. signifies marksman. These abbreviations are used in succeeding tables.

[2] The total number of qualified men considered in the various tables embodied in this article ranged from a maximum of 5,557 in Table 12 to a minimum of 5,493 in Table 3. This difference in the totals was due to the inability to secure complete data for all of the men. Only those cases were used in the several tables for which the definite information in question could be obtained.

[3] In this table as in Tables 2, 3, 4, 5, 7, 8, 9, 10, 12, 13, and 14, the distributed figures in each line from left to right total approximately 1,000.00, the deviation above or below in no instance exceeding .01.

pears that during that period there was an aggregate of 153,784 men with less than five years' service in the Army, and 68,765 with over five years' service. Since some of these men were accounted for in each of the three years, it seems to be more desirable to obtain an average for the period by dividing by three. When this is done, we find the average annual strength for men with less than five years' service to be 51,261, and for those with over five years' service, 22,921. Aggregating the number of men who qualified with various lengths of service under five years, as shown in Table 5, and those with over five years, we obtain the following data:

From Table 6 it is evident that for both the total number, and for each of the different grades, a larger proportion of individuals with over five years' service qualified. Most commissioned officers and non-commissioned officers of higher rank who qualify, fall undoubtedly in the group having the five years' service or more. It is apparent how much this factor influences the findings in regard to the effects of race, since officers and non-commissioned officers, who are included and are predominatingly white, naturally increased the proportion of men who qualified in the highest grade of marksmanship.

It is the commonly accepted opinion, though, so far as is known, one which is unsupported by any statistical evidence, that relatively a larger number of Negroes than Whites reenlist in the military service, and that, consequently, colored soldiers have on the average a greater length of service. If this be true, the effect of the length of service upon the relative number who qualified as sharpshooters among the Negro troops is of material importance.

TABLE 6.—CHARACTER OF QUALIFICATION BY LENGTH OF SERVICE OF THOSE WITH LESS THAN FIVE YEARS AND WITH OVER FIVE YEARS

Length of service	Absolute numbers E. R.	S. S.	M. M.	Total
Less than 5 years	157	1,302	1,702	3,161
5 years and over	285	1,086	962	2,333
	Ratios per 1,000 Men in the Army			
Less than 5 years	3.06	25.40	33.20	61.67
5 years and over	12.43	47.38	41.97	101.78

TABLE 7.—CHARACTER OF QUALIFICATION BY AGE

Age	Absolute numbers E. R.	S. S.	M. M.	Total	Distribution per 1,000 E. R.	S. S.	M. M.
19 and under	4	63	120	187	21.39	336.90	641.71
20-24	111	753	1,033	1,897	58.51	396.94	544.56
25-29	142	771	796	1,706	83.24	451.94	464.83
30-34	90	451	400	941	95.64	479.27	425.08
35-39	52	205	173	430	120.93	476.75	402.33
40-44	30	103	121	254	118.11	405.51	476.38
45-49	11	30	31	72	152.78	416.67	430.56
50 and over	3	9	14	26	115.38	346.15	538.46
Total	433	2,385	2,685	5,513	80.36	432.61	487.03

Age in Relation to Character of Qualification

Table 7 shows that the relative number of those who qualified in the highest grade, expert rifleman, progressively increased through the age of 49, the number of those 19 years and under being 21 per 1,000, and of those 45 to 49 years, 152. The relative number of sharpshooters also increased through the age of 39, while that of marksmen decreased. This table is closely related to Table 5, showing the influence of length of service.

(To be concluded)

Death Takes Toll of Riflemen

"CEASE Firing" has sounded for five well known riflemen during the past few months, taking from the ranks of the shooters familiar figures who have left their marks upon the annals of rifle practice.

The first of these men to go was that veteran shot, Colonel Gildersleeve, one of the early presidents of the N. R. A., a member of the first International Rifle Team and a contemporary of General Wingate. The second was Dr. L. S. Chilcott of Bangor, Me., who for more than a quarter century had been active in promoting the sport in New England; the third was Col. Edward S. Bryant of Ohio, one of the leaders in putting that state on the map in marksmanship; the fourth was Joseph T. Lawless, one of the younger generation from New England, but a shot of sterling worth and a member of the 1920 Olympic team, and the fifth was Dr. Louis Bell, one of the older members of the Massachusetts State Rifle Association.

HENRY ALGER GILDERSLEEVE

Early in April, at his home in New York City, Judge Henry Alger Gildersleeve died at the age of 83.

Born on a farm in Dutchess County, N. Y., in 1840, he recruited a company from his home township in 1862, served through the Civil War, mostly with Sherman's Army, and with the close of hostilities, having been brevetted Lieutenant Colonel by Lincoln for gallant and meritorious services, he began his civil career at the age of 25.

While devoting his attention to the duties of his profession, Colonel Gildersleeve did not lose his interest in military matters. In 1870 he was chosen Lieutenant Colonel of the 12th Regiment of the National Guard of the State of New York, and the same regiment chose as Major S. V. R. Cruger, formerly his brother officer in the 150th. During the Orange riots in New York City in 1871, Colonel Gildersleeve had command of the 12th Regiment, which was assigned to the defense of the State Arsenal at 35th Street and 7th Avenue.

Soon after entering the National Guard, Colonel Gildersleeve was deeply impressed by the ignorance of the guardsmen in the practical use of their rifles. Men served their entire time of enlistment without firing a single ball cartridge, received no instruction in marksmanship, and had no knowledge of it whatever. To remedy this state of affairs, Colonel Gildersleeve helped to organize the National Rifle Association of America, the object of which was "to encourage rifle practice and to promote a system of aiming drill and target firing among the National Guard." Of this association Colonel Gildersleeve was one of the incorporators and directors, and for years he devoted much time and energy to its service as Secretary and later as President.

It was on the range of this association at Creedmoor, while preparing himself to instruct his regiment in rifle practice, that he acquired the skill in marksmanship which soon made him famous. Possessing in a high degree the natural qualifications of good eyesight, rare nerve, excellent judgment and application, he soon succeeded in carrying off many prizes in various competitions. In 1874 he first came into national prominence as a rifleman by his work as a member of the American Rifle Team in its first contest with the Irish team at Creedmoor. This exciting match the Americans won by a narrow margin.

Colonel Gildersleeve's work in this great contest had shown that he was in the foremost rank of marksmen. When, in the following year, it was decided to send a party of riflemen to Great Britain, and give the Irish a return match, he was unanimously chosen captain of the team. The party sailed from New York on the S. S. "City of Chester," of the Inman Line, June 5th, 1875. They were received in Dublin with genuine Irish enthusiasm, and entertained with warm and generous hospitality. The match came off at Dollymount on June 29th in the presence of twenty thousand spectators, and resulted in a pronounced victory for the Americans. The American riflemen also took part in competitions in England and Scotland, and won many individual victories in brilliant style.

Colonel Gildersleeve captained the expedition, his public speeches, and his individual skill in all the contests were eminently satisfactory to the members of his party and to his countrymen at home. The victory stirred the American people to great manifestations of joy, and the team were received, upon their arrival in New York, with demonstrations befitting the return of heroes from a successful war.

Colonel Gildersleeve in 1876 embodied the lessons of his experience in a book entitled "Rifles and Marksmanship," which obtained wide circulation. Governor Dix offered him the position of General Inspector of Rifle Practice in the State of New York, but he declined the proffered honor.

Meanwhile he continued active service in the National Guard. In October, 1874, he had been chosen Assistant Adjutant General and Chief of Staff in the First Division in this State, with the rank of Colonel. He was later elected Colonel of the 9th Regiment, but refused this honor, preferring to remain Assistant Adjutant General. This latter position he held for more than twelve years. When the National Guard organization in New York City was reduced to a brigade, Colonel Gildersleeve was placed on the list of reserves, and thus ended his active military life.

His long and honorable judicial career began in 1875, when he was elected Judge of the Court of General Sessions in the city of New York by a large majority, running

considerably ahead of the rest of his ticket. For fourteen years he sat on the Bench of that Court, disposing of over 15,000 criminal cases of every kind and description; and in that immense number only two of his decisions were reversed by a higher court.

Although nearly 83 years old at the time of his death, he kept up his interest in outdoor sports to the last; he still enjoyed his fishing and hunting, and was a well known golfer. His numerous clubs reflected his interest in sports. An agreeable public speaker, his services in this capacity were much in demand.

DR. LANGDON S. CHILCOTT

From Thomas Martin, the veteran rifleman and sight maker, comes word of the death of Dr. Langdon S. Chilcott on May 6, 1923, at his home in Bangor, Me. "Trim Nat" in paying his last tribute to his fellow rifleman of old times says:

"Dr. Chilcott was born in Jonesport, graduated from the Dental College of the University of Pennsylvania, practiced for some years at Bar Harbor and Ellsworth, coming to Bangor in 1884.

"He served in the Maine National Guard, with the rank of Major, also in both branches of the City Council. He was a 32nd degree Mason, Past Commander of St. John's Commandery and a member of Kora Temple, Mystic Shrine.

"He formed the Bangor Rifle Association and was President of it up to the time of his death; he was an enthusiastic rifleman and a true sportsman in every sense of the word. A skillful rifleman, he did much to interest all he came in contact with to learn and practice for their own benefit and as an asset to his native State.

"As a conservator of the Fish and Game Laws, he abided by them himself and preached their enforcement to all others and by his square dealings, made very many lasting friends, who will mourn his loss sincerely.

"The American Rifleman has lost one who has for long followed its news with much interest and like many others, has trusted it as the only real adviser of the earnest and sincere rifleman. Through war, or peace, in good times or evil, all riflemen everywhere in these United States, have known him as an honest and fair rifleman, a good citizen and a sincere friend. For many years that has been my unbiased verdict and now that the friendship has ceased, I feel suddenly that the world has grown smaller to me, although I feel and trust our departed friend has gone to a better and happier home. Let us all unite—*Vale et vade in pace.*"

JOSEPH T. LAWLESS

Few details of the death of Joseph T. Lawless are available, save that he succumbed to an attack of pneumonia several weeks ago at his home in Waltham, Mass.

"Joe" Lawless, as he was known to the shooting fraternity, became identified with the shooting game in the early days of the national matches when he was a member of the Massachusetts National Guard, and was one of the best known shots on the Wakefield Range.

After the World War, Lawless came back into the game as one of the A. E. F. Team squad at Caldwell, and remained active, becoming known as one of the steady and reliable shots.

In 1920 Lawless won a place on the United States Olympic Team and was a dangerous competitor in subsequent international tryouts.

DR. LOUIS BELL

In announcing the death of Dr. Bell of Boston, who was also prominent as an electrical engineer, H. H. Bennett writes:

"Dr. Bell was one of the older members of the Massachusetts Rifle Association, and was deeply interested in the scientific side of shooting, so that his opinions on ballistics always commanded attention.

"He was a fine offhand shot with the rifle, although of late he had confined his practice mainly to the pistol. He was an authority on applied optics, and his latest work on the telescope is of more than passing interest to riflemen who are concerned with the theory of refraction as applied to rifle telescopes."

COLONEL EDWARD S. BRYANT

Major A. B. Critchfield sends word of the death of Colonel Bryant, who was one of the real pioneers of rifle practice in the Middle West. Major Critchfield writes:

"It is truly regrettable to announce the death of Colonel Edward S. Bryant, which occurred on June 6th at his home in Bloomdale, Ohio, after a long serious illness from heart trouble. Colonel Bryant was truly a pioneer as well as an enthusiastic promoter of the shooting game. For many years he maintained a company of the Ohio National Guard in his little town. He devoted especial attention to rifle practice and it is doubtful if any organization in the entire country can show a bunch of rifle shots as this company has produced. Many members of this company have been known to the world of riflemen for many years, as it included such familiar names as Colonel Winder, Captain W. H. Richards, Harry Simon, the Frye brothers, Lieutenant Smith and several other nationally known riflemen. These men were members of Colonel Bryant's Company H of Bloomdale. They got their initial instructions and encouragement from him. His enthusiasm and efforts soon spread beyond his home company. The regiment caught the spirit and the entire outfit began to send up a lot of champions like Stemple, Rothrock, Emerson and Eastman.

"Without Colonel Bryant it is at least doubtful if any of these famous rifle shots would ever have reached so successful development. He was patient, persuasive, enthusiastic, earnest and successful. Most of his work was accomplished under far more difficult conditions than obtain today. But he never let up. He surmounted every obstacle and with his persistent will and effort kept his boys (as he was so fond of expressing it) going until they became familiar figures at every match everywhere at home and abroad.

In the passing of Colonel Bryant the rifle game has lost one of its real pioneers; its most enthusiastic and earnest promoters, and to him we owe an everlasting gratitude for the unselfish labor devoted in the development of the greatest game ever promoted. He is entitled to a permanent place among the pioneers who have worked out and developed our present high national standing and it was such as he that compelled more favorable recognition of what should be a national pride."

Case Hardening

By J. B. Early

I NOTICED a request for information on casehardening for colors in a recent issue of Arms and The Man. I am giving a method from "Machinery's Hand Book" published in *Mechanical Engineers,* section "Heat Treatment of Steel." I have used this method in refinishing an L. C. Smith double gun, going on the theory that there are a number of cheap double guns on the market with malleable-iron frames (where steel should be). If malleable iron will stand the pressure, then casehardened steel, free from flaws or cracks, certainly should. My gun was tested with heavy proof charges after the work was completed (me behind a stone wall). The rifle, however, is a different animal. As a toolmaker and machinist, and one thoroughly familiar with the nature of metals, let me say to those who are not in position, through lack of equipment, knowledge, or skill, to be absolutely sure of the physical change which will take place in the structure of the metal treated, to attempt no kind of refinishing other than those in which solutions are applied cold, such as Hoffman's Bluing Solution. In casehardening, parts are so often warped and distorted that the parts cannot be assembled, and are thus ruined, not taking into consideration the fact that in heating and quenching steel there is the ever present danger of a surface crack appearing which will not be found until too late, ever so small a crack which would not appear to the naked eye might prove very dangerous. Composition and heat treatment of steel is receiving the attention of some of the greatest chemical engineers and scientists of the day. Brazing or otherwise heating barrels or gun parts should not be done, except by an expert sure of the result. (Moral: A little wear or rust on a gun is far better than a glass eye in the head.)

For hardening, and at the same time coloring steel, the following mixture may be used: Mix ten parts of charred bone, six parts wood charcoal, four parts of charred leather, and one part powdered cyanide. The leather should be black, crisp, and well pulverized, and the ingredients well mixed. The object in charring the bone and leather is to remove all grease. The parts to be colored must be well polished and entirely free from grease. (Avoid handling with bare hands). To obtain satisfactory results these rules must be observed. The parts to be hardened and colored should be packed in a piece of pipe having a closed end, each part entirely surrounded by the mixture. Pipe is preferable because the pieces can be dumped into the water with little or no exposure to the air. The open end of the pipe can be placed close to the surface of the water before the parts are removed. The work should be heated to a dark cherry red and kept at that heat for about four or five hours: if the temperature is too high no colors will appear. The tank containing water for quenching should be arranged with a jet of compressed air at the bottom so the tank will be filled with bubbles. There should be a sieve, or wire basket in the tank for receiving the work. If the colors are too gaudy the cyanide may be omitted. If there is still too much color, leave out the charcoal. After quenching, place parts in boiling water five minutes and then dry.

It Hasn't Paid Me

By Ted Allen.

EVERY now and then a fellow has a chance to pick up one of the old smoke wagon variety of cannon and even though his "kale" is low he will usually come through and shell out, and go home after dark so the big fat stiff next door won't see him. But once in a while a nut will glom onto an old hunk of bored out iron and wood that won't shoot anything but cartridges of the vintage of '67 and the kind that have laid away on Bannerman Island for fifty years since the last one was made. Well you get me—don't you, Pal?—that there's a whole lot of us foreflushers sticking around who have done this very thing; a lot like me who have found out that it pays best to let some other cracked-brain, on leave from his keeper, buy the old iron or at least the old Fourth of July stuff.

There's a Geezer that lives out near me who went and got a .25-20 rifle. The gun was there with the goods, but the shells that Nut pulled out of his pocket would have made Andrew Jackson stand up and knock his old hat off. They were the first box that came out of the Ark and the powder in them looked like a ton of soft coal, after it has all slacked down into a pile. Well, this guy got a hunch that he could shoot and began blazing away. At first he hit the old lard bucket several times and after pushing a couple of buttons off his chest he passes me the rifle. The minute I mitted the thing and got it lined up and fired I got wise to the fact that I had missed the bucket. Spitting on me mudhooks I went at it again and missed it some more.

"Old dear," says me friend, "you better let me have that spiral tube again before you teaches it some Bowery habits." I slipped him the smoky thing and watched him miss the hog container a couple of times.

"What-d-ju do to it?" says he.

"Why nothin' a-tall," says I.

"The hell you didn't," says he, "you've ruint the arm, you have; it shot perfect before you took it."

"You poor prune," says I, "what the sanko could I have done to it? Go chase yourself; your old gun's no good or else your luck's left you."

"Luck me eye!" says he; "I'm a marksman, I am, but no bum like you can call my shootin' luck neither. Whatdjer do to the thing? That's what I want to know?"

Well we throwed the bull until we both seen that chatter wouldn't get us nowhere's. Taking the rifle I opened up the action and started to take a squint up through the thing to see if it had any rifling left in it. I couldn't see none and says: "This here gun ain't no rifle, it's a fowling piece, or in other words, it's a piece of fouling."

"What's that you say?" says him, a-grabbing it with his mudhooks as though I might run off with it. "There's nuthin' foul about it but you and if you'll move I'll take a squint at it myself."

Well he stopped his chatter long enough to try to see daylight through that barrel. "What the hello," says he in despair, "it's ruint, the rifle's 'er all gone out of the muzzle. Them shells must have iron bullets in 'em."

They weren't iron, but they were leadibus pureibus and we had one grand time cleaning that gas pipe.

Another time a Pal of mine and me tried out an old .45-70 and we were trying to save some jack by using some ancient loads as old as the hills. The blooming thing fouled at the muzzle like a Ford muffler and we couldn't connect up with anything. Same old story in a .32-40 using some old vintage of '59 capsules, the same ones pictured in the sporting columns of that year. Couldn't hit a thing after the first few caps were snapped and the cake was thicker in the muzzle than a ten-year old brier. Now, Pardner, after you had gone and spent your hard earned white beans of commerce for such stuff with these kind of results, wouldn't you have cussed, too?

Well there was only one way that helped the matter and that was for one guy to lug along a can of grease. If you would stick the lead end of these old wrecks into the grease they would shoot like a kid with a sore thumb would shoot marbles. But this grease would keep down the cake in the bow end of the old sister. The whole trouble was that the axle grease to slip them by with had all dried up and all the ancients needed was more slickum.

But when it is all put down in the little old red book you can take it from me, Bo, that it don't pay to monkey with this old moth-eaten ammunition, especially the black-powder, soft coal issues of the ages past. The old slug slingers themselves are all to the good, but, believe me, if I can't get good food for the thing made since the Civil War I don't feed it. It just lines up alongside of the rest of the old stiffs in the useless row. But if the old gas pipe is in good shape and fresh fodder can be glommed for it, why, kiddo, the fun you can have is rich and thousand yard bulls ain't in it. But, Pal, lay off on that old junk; it's nix, and it hasn't paid me.

MORE HINTS FOR THE SHOOTER

By N. F. Page

PROBABLY all of us dislike to use ammonia or ammonia fouling solution because it messes up the gun so much. The usual procedure is to saturate a rag with the smelly stuff, place it in the breech, then poke it with the rod several times and finally it goes down the barrel just as a nice rag should, in the meantime the fingers get wet with the dope and then it gets on the outside of the gun and invites rust. Try this. Rest the muzzle on several thicknesses of newspaper, push a moderately tight rag down the barrel a ways, then with a fountain pen filler squirt in a quantity of the dope and proceed in the usual way. Caution, look out you do not break the end of the filler off down in the barrel.

The cleaning of shell annoys me so much that I am apt not to do it even when they get very dirty. Major Whelen's cleaning chemicals mentioned in "The American Rifle" are fine but keep them out of the kitchen sink or you are storing up trouble for yourself as well as getting yourself disliked by friend wife. Method No. 1. Boil the shells in a strong solution of lye water, even strong soap will do to remove the grease. Then immerse them in a solution of one teaspoonfull of sulphuric acid to a gallon of water. Dry the best way you can. Method No. 2. Probably most shooters have enough ingenuity to make some kind of a device to spin the shells, the faster the better. First get a piece of wood or better still a piece of iron that fits the spinning machine on one end and is considerably smaller than the shell to be cleaned on the other end, now split it down a ways and twist up a little fine steel wool and insert it in the slot. Wet the shells to be cleaned and shove them on over the steel wool while you revolve it rapidly, in an instant the inside of the shell will shine like new. Sad to relate it does not work very well on small bottle neck shells like 25-20. The outside may be cleaned in a similar manner by having a suitable stem upon which the shell may be tightly wedged. For a polishing solution do not overlook the humble salt and vinegar we used to clean the brass on the harnesses with when we were boys on the farm. Saturate a rag with the solution and hold it on the shell while you revolve it rapidly, the result will be wonderful. The primer pocket may come in for the same manner of cleaning if desired.

To dry the shells try this. Stand them on their base on a stove cover and heat over the stove. Note that as long as there is moisture on the inside of the shell the temperature cannot be over 100 C. which does no harm, but watch very closely and pick them off as soon as the moisture disappears. The best way to dry a shell is to do it the way chemists dry bottles—with bellows. If you have no bellows use the tire pump on the flivver. This method is certainly fine for drying the primer pocket. Of course you can dump the shell in a kettle of boiling water, then empty them out into a wire basket or colander and shake around over a hot stove or let them dry of their own heat, the only trouble with this method is that it will not work—for me at least. I always end up by using the stove cover method or the pump.

HANDY SCALES

By Perry Frazer

IN recent issues of "Arms and the Man" several writers have referred to the high cost of scales accurate enough for measuring powder. I was one of these, for I wanted scales for weighing powder charges, and also for use in my shop and for weighing chemicals in photographic work.

In looking up some plate speeds and filter factors I came on a copy of a little booklet issued by the Eastman Kodak Company, entitled "Eastman Plates." This, by the way, is a handy booklet for one's files, if he fusses much with photography. On the last text page are a cut and description of the Eastman studio scales. They looked good to me, and the next time I visited my supply man I asked to see the scales, with the result that I purchased a set, and am glad of it, for they are sure handy for all-round work.

These scales come in a strong box, well-packed, and have as a base a solid block of wood on fibre legs, so that the block may be moved about without scratching a good table or desk. On each end is a thin metal pan, cut with an ear to serve as a handle. At each end of the balanced bar there is a little threaded rod carrying a small weight, which may be turned at will to maintain a perfect balance of the bar.

The reading scale is marked in grains, from 1 to 50, while an arrow registers over a notch at the base of the central standard, a device that is always visible. Then, in holes fitting each, in the wood base, are metal weights shaped somewhat like a glass push-pin, from ¼ ounce up to 2 ounces. The bearings are hardened steel, other fittings in nickel and dull black, with white markings. The retail price is $4.50. One style has avoirdupois, the other metric markings.

While the reading scale will register one-half grain, one can even split this by using a tiny weight of a quarter grain. And I find that an old set of weights that I had worked nicely in conjunction with those furnished.

"The Dope Bag"

A free service to target, big game and field shots, all questions being answered directly by mail.

Rifles and big game hunting: Maj. Townsend Whelen.

Pistols and Revolvers: Maj. J. S. Hatcher.

Shotguns and Field Shooting: Capt. Charles Askins.

Every care is used in collecting data for questions submitted, but no responsibility is assumed for any accidents which may occur.

THE SCOPE PROBLEM

I HAVE just been reading your book "The American Rifle," and wish to congratulate you on the very able work you have put out.

My experience with a rifle has been confined almost entirely to my close association and friendship with the late E. A. Leopold. He and I spent many hours discussing his experiments with the flight of bullets, bullet grease, and the hunting telescope.

My interest in outdoor sports was then, and has until now been in dog and shotgun (quail and pheasant shooting, with occasional rabbit hunting).

But of late years, I have come in closer touch with the rifle through my friend Dr. J. R. Care, who has made yearly trips to the Yukon and Canadian wilds—he being rather an enthusiast on rifle since he gave up the shotgun—has now a collection of about thirty rifles, including Springfields, Rosses, Newtons, Sauer Mausers, Savage, Remington, and about all others.

Leopold and a man named Seidle, from Germantown, Pa., were then trying to get up a scope that would give enough leeway—to be practical as a hunting scope—and Seidle made one of about six power that Leopold was trying out about the time he died. This scope was not practical for the reason of its small field and small vision.

But I have always had in mind some sort of scope that could be used with some satisfaction in the field—a quick detachable one. I used it. You will note probably enough fault to condemn it altogether. This scope can be removed in a second almost and put on that quick. It is strongly made and gives sufficiently wide field to follow any moving object, even at close range, should one want to use it that way. But my idea of a hunting scope is for use when an object is at such a distance to make it uncertain without scope.

This scope, as you note, has an adjustable cross hair or sights—than can be raised or lowered—they are not cross hairs but metal points projecting in from either side and the bottom and admit more light than any scope I ever saw, but I feel sure a scope like this is practical.

The mounted scope that comes with the imitation Mausers and the genuine Mausers—what I have seen—are about six power and they have a quick detachable mounting—but as I did not like the bolt action in a rifle I did not examine them as closely as I should, to form an opinion. So being engaged in New York this winter I thought I would look it up.

I bought a .250-3000 Savage, lever action, and at same time saw one of those German scopes—that attracted my attention by their large lenses—so I bought one marked "Berth & Newmann" 4½ power, without fittings or mountings, as there are none that would suit such a combination, so I got a piece of wood and made a model fitting and had my brother make it up, as you see. I am sending you a picture of the outfit as it is now. But since reading your book I find it is far from what is needed in some respects. Although I hope to get it at a point where it will be useable—first, by making a new dovetail to go on gun—a piece with a shoulder or strap—as the lever screw does not hold it from sliding forward on recoil. This is one failing I just discovered last time although the one specimen I did examine appeared quite practical.

Now I hope you will excuse the liberty I have taken in addressing you thus—but I feel there is a sort of Freemasonry among sportsmen that is void of formalities.

I will apologize for the photographs, as they were made one evening in a hurry. After a little more experimenting I shall make good ones. I have since removed the Buckhorn Sights. The telescope had not been adjusted when photo was made and is a trifle low. It is not adjusted yet, as I have tried it but once since having it mounted and that was a crude trial and of no use.

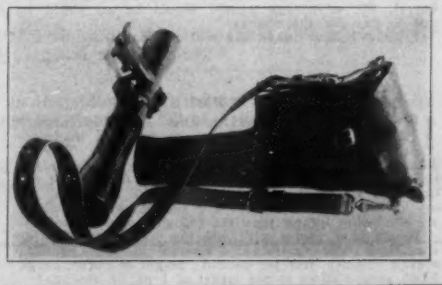
S. H. C., Norristown, Pa.

(Answer, by Maj. Whelen)

I am very glad to have received your letter of June 17. I, of course, know the late E. A. Leopold very well by reputation, and met him once at Sea Girt, in 1906 I think it was. He was one of the first men to make a really scientific study of the rifle, and we are still profiting from the results of some of his investigations.

I was much interested in your telescope sight and mount. I know John W. Seidle very well. He had a little shop about 6th and Vine (or Race) Streets in Philadelphia. About 1910 he moved to Corning, California, and died there about three years ago. His telescope sights were excellent for their day, but they were not designed to stand the heavy recoil of high power rifles. I still have one of his "Snap Shot" telescope sights, which I think is the glass he and Leopold were working on. It has a large, bright field for the glasses of that day, but the eye relief is entirely too short for modern rifles of rather heavy recoil (only about 1½ inches).

By all means get a copy of "The American Rifle" from the library, and read the chapter on telescope sights. I think it will save you much time, trouble and money. In it I praise the optical qualities of the German low power, large field glasses very highly.



Above: The kind of scope mount which will not be satisfactory. Below: The mount on rifle.

But I also call attention to the fact that not a single one was of such construction that it would stand the sharp recoil of modern rifles. It is not only the heavy recoil, but also the quickness of recoil of rifles with velocity about 2500 f. s. that wrecks so many poorly constructed telescopes.

But since the War there has been a great improvement in the construction of these telescopes. Through exhaustive tests by various ordnance boards we know that the telescopes of at least five makers (Winchester, Feeker, Zeiss, Goerz, and Hensoldt) are of excellent and modern construction, and, if properly mounted, will stand up indefinitely on modern rifles. There may be some other German glasses that also will do so, but to determine if they will would take long and very expensive series of tests with a number of glasses, and no amateur can afford to make such tests. This applies to your Berth and Newman glass. It may be all right—probably is. Had I reliable American or British evidence of at least ten of these glasses standing up without defect for at least 5,000 rounds, I would then be prepared to state that the glass was all right, but at present I have only evidence as convincing as this in the case of the five makes listed above.

To zero and use a telescope with satisfaction it must have properly adjustable and graduated mountings, and these mountings must be strong enough to stand reasonably hard service. The mounting must be capable of fine adjustment, otherwise you limit your accuracy by the accuracy of the mounting. Certainly they should be adjustable to at least a minute of angle—that is to 1 inch at 100 yards. After a telescope is mounted the first operation is to zero it with the ammunition you are going to use. Say this ammunition is of a certain make, sold you by a dealer from a case of 2,000 rounds he has purchased, and which was loaded at the factory June 5, 1922, from loading machine No. 3. Zeroing, we will say, consists of so adjusting the telescope, combined with range firing, that the point of aim and point of impact at 100 yards coincide—that is the center of the group the rifle fires will be just where the cross-hairs rest at 100 yards. You can do this quite readily, and with a few shots if you have mountings positively adjustable to minutes of angle, and with scales on the adjustments that permit of accurately recording the adjustments. But if you have to rely on bending, or tapping, or sliding joints back and forth it will take you perhaps three or four visits to the range, combined with perhaps 150 rounds of ammunition at say $8.00 a hundred to get the telescope properly adjusted. And even then you have it adjusted for 100 yards only, and for one lot of ammunition only. When you run out of ammunition you go to your dealer to get more. This time he sells you some which he has taken from a case loaded on November 10, 1922, from loading machine No. 2, and it shoots four inches off at 100 yards from where the first lot shot, so you have to zero the telescope all over again at the expense of two or three trips to the range and several hundred rounds of ammunition. You spend more ammunition and time in getting your telescope adjusted than in regular shooting, your rifle barrel wears out quickly, and you never have any real confidence in the combination. All this is directed at the particular type of mounting shown in your photographs. Theoretically, it is all right—practically it is impossible. Moreover, it is not a serviceable mount. A sharp blow, a fall, striking on the front or rear of the telescope will put it out of adjustment, and everything has to be done all over again.

Suppose your mountings and reticule have accurate micrometer adjustments graduated clearly to half minutes of angle. You make the preliminary adjustment by bore sighting at home. You buy 200 rounds of ammunition from one lot. You go to the range. First shot strikes six inches below and four inches to the right of point of aim. You raise the elevation 12 half minutes, and move to the left 8 half minutes. The next shot strikes very close to the point of aim. The telescope seems to be properly zeroed for 100 yards. From the trajectory table for the .250-3000 Savage cartridge you find that the height of trajectory for 200 yards is about 2½ inches high at 100 yards. Therefore, elevating the mounting five half minutes should give you your 200 yard elevation by making the rifle strike on an average 2½ inches above the point of aim at 100 yards. In like manner you can find the adjustment for all other ranges. Before you leave the range you take the telescope off the rifle, put it back again, and fire a shot to see if removing and replacing has altered the adjustment. It should not if the mounting is as it should be. The next two or three times you go to the range you go over this again, and if everything proves up the same you begin to feel a reliability in your rifle and telescope, which will enable you to do good work in the field with it. You have expended perhaps 40 rounds of ammunition at a cost of about $3.20 and you still have 160 rounds of that particular lot of ammunition left, which should last you for several years of hunting. Such a mounting may cost a little more in the first place, but you more than save its cost in the cost of ammunition used in getting properly sighted in, and you get satisfaction and reliability.

The length of the base line of the mounting deserves serious consideration. Your bases for both elevation and windage are merely pivots with no length. These pivots are pins, say ½ inch in diameter. In the circumference of each are 21,600 minutes. How can you possibly adjust such a mechanical arrangement to minutes of angle? Suppose that the base line on your telescope—the distance from the pivot to the adjusting screws—is 6 inches. In 100 yards there are 3,600 inches. Six inches goes into 3,600

inches 600 times. Therefore 1/600 inch on either elevation or windage screws equals one minute of angle. It is easy to arrange these screws with micrometer heads and scales that will read this close, but it is difficult to do this if the base line is only 3 inches and the minutes of angle become 1/1200 inch.

No perfect telescope sight mounting has yet been made. To date we have found but two fairly satisfactory and reliable types. The Winchester double micrometer mounting is an example of one of these types. It is a fairly satisfactory type for target shooting, but it is not suitable for big game rifles because its construction is too delicate for the rough usage it would be subjected to, and the telescope slides forward after each shot, has to be pulled back, and hence is not satisfactory for efficient rapid fire. The Noske mounting, made by R. Noske, 35 Montgomery Street, San Francisco, California, is an example of the second type. This is a rigid mounting intended primarily for hunting rifles, and requires a telescope the construction of which is such that it will stand heavy recoil. The telescope should also be light or its inertia under recoil may tear the mounting loose. To date I have had a rather limited experience with this mounting—only four days on the range with it—but it seems very satisfactory. I should say that it was distinctly a hunting type of mounting, most satisfactory where the shooter confined his change in adjustment to one or two ranges, and hardly very satisfactory for the man who wished to be continually changing his elevation and windage as is so necessary in competitive target shooting.

I have gone rather deeply into this matter with you in an effort to help you out, and to save you much time and expense. I feel that if you are not started right you may become so discouraged that you will not care to continue. The telescope sight, properly adjusted and mounted, is a rather expensive luxury, and it also requires knowledge to run it. It will never be suitable for the uninstructed man. It is like a surveyor's transit—an instrument of precision in the hands of a good surveyor, but useless to a layman. But a good rifle with a good telescope is a joy forever to a good rifleman.

MORE ABOUT VIBRATION

I AVE received your reply relative to the difference in the shooting of my 45-90 mod. 86 Winchester with respect to the elevation, the H. V. cartridge registering 8 inches higher on the target at 100 yards than the regular smokeless, gun sighted correctly for the latter cartridge.

Was surprised at the statement that breech pressure variations are the cause of the difference in the shooting of different cartridges in the same rifle, and I must say that I cannot agree with you on this point, although your vibration theory is correct as I understand it. I do not agree with your pressure theory for this reason, which is proof enough to convince me that breech pressure does not cause the trouble in my 45-90. I have shot some reloaded ammunition in my rifle, using the 405 grain lead bullet with as much Schuetzen smokeless behind it as the shell would take, also the 300 grain lead bullet and full charge of same powder. Now I know for a certainty that the 405 grain bullet develops more breech pressure than the 300 grain bullet, nevertheless the 405 grain bullet with its higher breech pressure shoots 8 inches lower at 100 yards than the 300 grain bullet and its lower breech pressure. Of course, the higher velocity of the 300 grain bullet accounts for its higher shooting, but just why an increase of only 400 f. s. velocity register a difference at 100 yards is what I cannot understand. I am fully aware of the fact that a higher velocity always causes higher shooting, but this is overcome entirely in my rifle, as it throws the Winchester high velocity a full 8 inches higher at only 100 yards than the regular Winchester smokeless. That tends to convince me that this particular barrel is abnormal in this respect, and asked you about it in the other letter, but you did not answer that question. Also how does your 45-90 behave with the two loads, the regular and the H. V., as I am quite certain that every rifle differs somewhat in this respect. Kindly give me some more information on the matter. Vibration undoubtedly is the cause of the trouble, and I therefore think that the barrel of my rifle has some defect that causes it to vibrate upward more than a normal barrel does.

A. W. E., Biwalik, Minne.

Answer (by Maj. Whelen):

I have received your letter of May 20.

In my last letter to you I tried to show you the principle of vibration in order to let you come to your own decision. Vibration of a rifle barrel is caused by breech pressure. The higher the pressure the more the vibration. Also, of course, the thinner the barrel the more the vibration. The thinness of the barrel depends upon both outside dimension and caliber. A .30 caliber barrel of a certain outside dimension is thicker than a .45 caliber barrel of the same outside dimension. A .45-90 barrel for the model 86 Winchester is a very thin barrel, and its thinness and susceptibility to vibration is very much aggravated by the custom of cutting sight slots in it.

When a barrel is fired it vibrates up and down, and sometime a little to one side or the other. Sometime during these vibrations the bullet departs from the muzzle. If the bullet departs while the muzzle is at the top of a vibration that bullet will strike high on the target, and vice-versa. Most, but not all rifles, vibrate in such a manner that the higher the pressure and velocity the higher the point in the vibration at which the bullet leaves the barrel. There are many rifles and barrels that do just the opposite. Where a rifle is thoroughly standardized as to its construction, like the Springfield military rifle, the vibrations or jump are very constant, and we can tell beforehand just about what we are doing. But where a rifle is made with different kinds and lengths of barrels it is impossible to predict what the jump will be with a certain cartridge until we have tried it and found out.

A very thin barrel is very sensitive to jump and vibration. It probably vibrates very rapidly. One cartridge may cause its bullet to leave the muzzle at a certain part of one vibration, and another cartridge may cause its bullet to leave at an entirely different part of another vibration. Hence there seems to be no rule by which it can be determined in advance what the jump will be. This is probably the case with your rifle. Take a thin rod of steel, grasp it by one hand, and make the other end vibrate rapidly. Now consider the time that it takes a bullet to travel from one end to the other. If there is a difference in this time there will, of course, be a difference in where the muzzle will be at the end of that time. If there is a difference in breech pressure there will be a difference in the rapidity and extent of these vibrations.

To study this matter of vibration and jump requires extremely refined and expensive laboratory equipment, and the services of highly trained scientists, and is a very expensive undertaking. About six years ago the Winchester Company, at extremely heavy expense, undertook a study of this kind on three or four rifles, and carried it far enough to enable them to understand the underlying principles. To carry it out with every rifle, length of barrel, etc., would have cost hundreds of thousands of doldars, and could not be considered for a minute.

I am inclined to think that there is no practical way out of your difficulty. The difference in point of impact might be slightly decreased by a shorter barrel, by a barrel without any slots, or by a heavier barrel, but unless the barrel was made very much heavier, which is impossible with the magazine under the barrel, the advantage gained would be so slight as not to pay for the change.

I hope I have made the matter clear.

MARK VII AMMUNITION

I RECENTLY purchased a Ross .303 rifle through the N. R. A. and, prior to purchase, I made inquiry as to some of its characteristics. The information which I obtained concerning cartridges referred to the 215 grs. bullet. This, I find, is not the cartridge which I obtained through the N. R .A. for my rifle. My cartridges are the Mark VII which are somewhat lighter than the 215 grs. above noted.

Would you please give me the following data for the Mark VII cartridge: Energy in foot pounds; muzzle velocity, feet per second; height of curve, range 1,000 yards; effect at the target of 1 pt. of windage?

Using the battle sights (as issued) what is the theoretical range?

Using the battle sights (as issued) where would the bullet strike the target assuming that I hold just at the bottom of the bullseye, at 100 yards, at 200 yards, at 300 yards?

I hope to be able soon to change the rear sight and wou'd like to know what sight you would recommend for hunting purposes. I favor a peep sight and would like to have it closer to my eye than the rear sight is (as issued).

L. M. M., Duluth, Minne.

Answer (by Maj. Whelen):

The data on the .303 British Mark VII ammunition for which you ask is as follows:

Bullet 174 grain pointed, flat base.

Muzzle velocity in 25-inch barrel 2460 f. s.

Maximum ordinate in 1,000-yard trajectory, 17.8 feet.

Data as to the battle sight is not known, but you can easily determine it by experimental firing. In fact this is the only accurate method of determining it, as every rifle and individual will differ.

To obtain energy of any cartridge: Square the velocity, multiply by the bullet weight, and divide the result by 450240. In the above case 2460 x 174 ÷ 250-480 = muzzle energy.

To determine the effect of moving the windgauge one point, first find the dimension of one point of windage, and the distance between sights (sight radius). Divide the sight radius into the range, and multiply the result by the dimension of the point of windage. Example: Suppose one point of windage is .1 inch, and distance between sights 36 inches; 36 inches goes into 100 yards 100 times. 100 x .1 = 10 inches. Therefore, moving the windgauge one point will move the point of impact 10 inches at 100 yards or proportionately at other ranges. As I do not know the distance between sights on your Ross rifle, nor the dimension of one point of windage, I cannot figure it out for you.

I think the most satisfactory sight for the .303 Ross rifle is the Lyman receiver sight made specially for that weapon. This sight is not listed in the Lyman catalogue but they have a number of them on hand. It is a strong, accurate and very satisfactory sight.

THAT 49-GRAIN CHARGE

I HAVE some 30-'06 ammunition which I loaded about a year ago with F. A., 170 gr. gilding metal jacketed bullets with flat base and 49 grs. of Du Pont I. M. R. No. 16. At the time, you were recommending this as the maximum safe load with this bullet and as I remember the pressure was given at something between 50,000 and 51,000 lbs., which is rather high but not excessive. In the March 1st issue of the "Dope Bag" you speak of 48.5 grs. of No. 16 behind the 170 gr. bullet as a "little excessive." This latter answer made me just a little cautious of this ammunition which I have on hand as I thought that probably something new had been learned regarding this load and I am not going to fire any of it until I get your opinion as to its safety. The powder charges in it were carefully hand weighed.

I have the circular describing the Noske scope mount and have read all the articles on it that I can find, and so far I am unable to decide whether this mounting should be built with or without the elevation base for this particular outfit. Please give your opinion.

Any data that you might give me on loads and accuracy for this cartridge will be greatly appreciated.

You speak of a special rifle, to handle the 250-3000 cartridge, built on the regular Mauser or Springfield action. Are these actions not entirely too long for this cartridge? I have a couple of regular Mauser actions which I had thought several times of using one of, for such a rifle but from what I could see, together with what I could learn from gunsmiths led me to believe that there was entirely too much room in the magazine as well as too long a bolt throw. Would you explain how these features are handled in building such a rifle as you speak of?

I have a Remington-Hepburn rifle which I have just been taking stock of and am wondering if I might not be able to make it into a real rifle. The action is in most excellent condition and it has a 38-55 cal. barrel, which Peterson of Denver bored and throated for the Hudson bullet. This barrel is new and has never been fired and I, of course, know nothing about it except Peterson's reputation. I am under the impression that the 38-55 rifle is more or less of a relic now or I would fit it with a good set of sights and try to work up a suitable load for it. The advice I would like is, whether to do this, or have this action fitted with a barrel for a more modern cartridge and if I do decide to make a change what cartridge this would be best suited to handle. It would depend, of course, on what maximum pressure this action will safely stand. I had thought of a 25 cal. barrel chambered for the Krag cartridge necked down to 25 cal. but did not know whether I could get a worth while velocity with permissible pressure. This action has set triggers and a very short hammer travel which would indicate quick lock time and it seems to me that with a proper barrel it would make a nice rifle. Please advise me as to how I can get the most out of it.

R. R. R., Prescott, Ariz.

Answer (by Maj. Whelen):

The facts regarding the charge of 49 grains of du Pont No. 16 powder and the 170 grain F. A. bullet are as follows: The charge was originally worked up by the du Pont Company. Usually they are infallible on such matters and on the strength of it I informed several riflemen of this charge. One reported blown out primers, and I immediately tested it myself and found the pressure too high to recommend. I took the matter up with the du Pont Company and after a retest they concurred. The charge is safe if fired only in an absolutely normal Springfield chamber and bore, with the very best cases and primers. But I would not advise it, and I do not think 47.5 grains should be exceeded. I would advise your not firing this ammunition. Hope you did not load much of it.

Although I must beg lack of actual experience, I have gained the impression that the inclusion of elevating arrangements in the Noske telescope mounting so complicates it as to render it less efficient. Accordingly I have ordered mine with the microcometer windage adjustment only, and will obtain elevation by means of the reticule elevation screw on the Hensoldt telescope.

The regular Springfield and Mauser actions will handle the .250-3000 Savage cartridge all right. A piece of steel is fitted in the rear of the magazine so as to slightly shorten it. The long throw of the bolt makes no difference. Mauser makes a special short action which is just the right length for the .250-3000 cartridge, and this is ideal, but unfortunately up to date all our gunmakers have found it almost impossible to obtain any of these by importation.

Your Remington-Hepburn rifle should do splendid work with the heavy special Hudson bullet, and I should think it would be more interesting used thus than with another barrel. If you can get a mould for the Hudson bullet I can then supply you with all the data for loading. The combination should give at least three inch groups at 200 yards. It is, of course, essentially a target load.

From design alone the Remington-Hepburn action should work efficiently with high power cartridges, but I am not sure as to the materials used, and I rather think it ought to have a modern firing pin designed for high pressure.

APPLICATION FOR INDIVIDUAL MEMBERSHIP IN THE

NATIONAL RIFLE ASSOCIATION of AMERICA

Brig. Gen. FRED H. PHILLIPS, Jr., Secretary,
1108 Woodward Building, Washington, D.C.

Sir:

I hereby request favorable consideration of my application for .....membership in the National Rifle Association of America, and enclose herewith .....Dollars, being fee for same.

I certify that I am a citizen of the United States. Age ..... Born .....

in the County of ....., State of .....

Name .....Address .....

Business ..... City .....

State ..... Recommended by .....

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FOR SALE—Remington No. 24—.22 Short Automatic, $25. Remington No. 24—.22 L. R. Automatic, $25. Stevens Offhand, .22 caliber, 6-inch barrel, $11. Stevens Offhand, .22 caliber, 8-inch barrel, $12. Remington .25-20, slide action, $27. Remington .32-20, slide action, $27. All new, never shot. Homer, Binghamton, N. Y.

American sportsmen's almost criminal negligence made possible new fanatical laws curtailing our most cherished personal liberties. Would our humiliation not become intolerable if we let these cooties on our body politic DISARM us. Telling you again. Carrying 200 real guns for your convenience. Charging you but 10 per cent. That's SHIFF the GUNMAN, N. Woodstock, N. H. Ship your stamp and see inside.

FOR SALE—3 Cap and Ball .44 cal. Starr Civil War Revolvers, bullet mould, nipple wrench and directions, new, barrel bright, $8.00 each.
WANTED—Regulation Bayonet and Scabbard for .303 Short Model Lee Enfield Rifle, in good condition. Wm. F. Sattler, 514 Park Ave., Collingswood, N. J.

FOR SALE—2 cases .30-06 Springfield cartridges, never opened. First check for $32.50 each takes. F. A. Trahin, 516 Continental Ave., Detroit, Mich.

NEW ARMY GOODS FOR SALE—Haversack with Pack-Carrier, complete, $1; Web Pistol Belts 75c; Entrenching Shovel with Carrier, $1.25; Pick-maddock with carrier, $1.25; Army Axes with carrier, $1.00; Canvas Water Bucket, $1.00; Medical Dressing Case (Ambulance Box), $7.00; Reclaimed Gov. Kit Bags, $1.00; Reclaimed Army Belts for .30-06 cartridges, capacity, 100, 75c. Service Equipment Co., 16 Jefferson Ave., Maspeth, N. Y.

FOR SALE—Remington No. 24—.22 Short Automatic $25. Remington No. 24—.22 L. R. Automatic $25. Stevens Offhand, .22 caliber, 6-inch barrel. $11. Stevens Offhand, .22 caliber, 8-inch barrel, $12. Remington .25-20, slide action, $27. Remington .32-20, slide action, $27. All new, never shot. Homer, Binghamton, N. Y.

FOR SALE—One genuine Luger automatic pistol, short barrel, in good condition, $30. One Mauser, German Officers' Model, automatic pistol in wooden case which fits on pistol grip to form rifle stock; 8-mm., good condition, $25. One Mentor camera, graflex type, 10 cm. x 15 cm., Zeiss Tessar 4.5 lense, 21 cm. focal length, focal plane shutter, ⅛ to 1/1300 second, Reitzschel telescopic lense with ring, two film pack holders, three double plate holders, one holder for twelve plates allowing latter to be changed without removing holder from the camera. leather carrying case, and wooden tripod, $175. Will exchange Luger or Mauser for cal. .22 Colt automatic target pistol in good condition. William K. McKittrick, Moultrieville, S. C.

I GUARANTEE your rifle, when mounted in our full sporting stock, to be as accurate, as when mounted in any other stock made, regardless of price. There are no strings on this guarantee. We take your word. If not satisfied, in every way, we return your money promptly on return of stock. Hand made for Springfield or Krag, of best American and foreign walnut. Any design, any measurement, any style of checkering. Price, unfinished stock, barrel and action let in, all shaped up, fully checkered, $15.00 to $25.00. Finished complete $25.00 to $50.00. Stamps for photos. R. D. Tait, Montague, California.

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FOR SALE—3 boxes .32 New Police $1.50. 2 boxes .32 Colt Auto. $1.50. 60-.30 '06 60 cents. 165 .38/40 $1.65. 200 .455 Ellys $2.00. A. L. Steitz, Warehouse Point, Conn.

WANTED—.45/70/405 reloading tool, Ideal preferred. Ray Forsyth, Pikeville College, Pikeville, Ky.

FOR SALE—Krag carbine, new sporting sights, $8.00. Winchester .38-55, 30-inch octagon barrel, single shot, No. 1 condition, $8.00. 1895 Winchester, 30-inch round barrel, box magazine, caliber .30-40, No. 1 condition, $18.00. Money order or certified check. Gustave Blanknagel, R. 3, West Point, Nebraska.

FOR SALE—Stevens' Ideal .22 long rifle with two barrels. One Stevens' 24-inch barrel with globe front and folding leaf rear. One Peterson barrel, 28 inches, with Winchester scope mounts, both perfect, finger lever like on a 94 Winchester No. 103 Lyman peep. Fancy walnut stock. A good gun in perfect condition for $55.00. Ross C. King, 155 No. Main Street, Los Angeles, Calif.

FOR SALE—Savage .22 N. R. A. Model 1919. Tapped for and fitted with blocks for Winchester No. 2 mounts, Malcolmn No. 2 6-power scope. Rifle cut down to sporting model. Stock finely checked and oil finished. Sell for $30.00. Krag Rifle barrel cut down to 24 inches. Stock cut down to sporting model, pistol grip dove-tailed in. This gun is polished ready to blue, front sight is not fitted. By bluing and fitting sight this will make a fine rifle. Sell for $12.00 as is. Theodore M. Carlson, 24 Elm Street, Warren, Pa.

TRADE—5x7 New Improved Senica View Camera, with all the latest improvements (no lens) 23½-inch Leather Bellows. Ten-plate holders, large canvas case, focusing cloth. Folmer & Schwing Collapsible Stand. All in like new condition for Springfield .30-'06 in like condition. J. R. Ziegler, Webster City, Iowa.

FOR SALE—Brand-new Colt Officer's Model, 7½ inch, .38 Special in perfect condition, $25.00. E. C. Schneider, 102 Eastern Avenue, Aspinwall, Pa.

FOR SALE—.38 Colt's Army Special, 6-inch barrel, blued finish, like new; first class gun crank condition. Very smooth light trigger pull, $23.00. O. E. Huff, care of Fulton Fdry. & Mach. Co., Cleveland, Ohio.

FOR SALE—20-gauge H. & R. single, case and cleaning tools, $5.00. 12-gauge Ivér Johnson, single, case and cleaning tools, $5.00. Winchester Scope, 5 X, post and mount for Springfield, $23.00. Pair "Prizma Paris, High Power" glasses, and case, $2.00. J. A. Browne, 627 W. Avenue 50, Los Angeles, Calif.

FOR SALE—Will accept best offer for brand-new Winchester single shot .30 Army, 30-inch No. 3 nickel-steel round barrel, take-down; positively never shot and not a scratch. Will also part with my pre-war Waffenfabrik Mauser .30 caliber pistol purchased from Von Lengerke & Detmold. 1,000 N. R. A. 75 feet targets, $5.00. Fred N. Anderson, 174 Lafayette Avenue, Suffern, N. Y.

FOR SALE—Account unavoidable change plans precluding possibility attending Perry Matches, one pressure barrel outfit by Winchester. Test targets by Cap Richard show startling accuracy. Never fired otherwise. Set trigger by Waller, cheek piece, rubber butt stock, pistol grip, 5A 'scope sight. No better outfit possible. Cost well over $200. Accept $150. No trades. Test targets accompany. Only reason for selling disappointment inability attend matches. T. K. Lee, 706-708 Brown-Marx Bldg., Birmingham, Ala.

FOR SALE OR TRADE—Krag carbine, new barrel, Springfield front sight, semi-sporter stock, Lyman No. 48 rear mounted by Sportsman's Service Station, SSS barrel band, and case of 1,000 rounds Remington '17 .30-40 ammunition for $35.00, or trade for Springfield (new) as issued, or government bench reloading tools, or new 7 m.m. Mauser sporter (high grade), guns must be perfect. Dunlap Roddey, Rock Hill, South Carolina.

WANT COLT OR S. & W. TARGET GUN—Prefer Colt .22 Auto. or S. & W. .22/32 in crank condition, priced reasonable. SELL OR TRADE—Winchester .45-75, 12, shot in perfect condition. Has extra fine oil-finish stock, octagon barrel, ivory-blade front sight, with barrel and action cover, 2 boxes cartridges, jointed rod to go in trap in stock and canvas case. Complete outfit for $12.00 or trade for good .25-20 or .32 revolver. Geo. W. Courtney, Winchester, Ind.

FOR SALE—One Savage N. R. A., good as new, $14.00. Trade for good telescope sight. Frank Jones, Box 481, Superior, Nebr.

FOR SALE—Springfield with brand-new star-gauged barrel, never fired, $30.00. WANT Marine Corps shooting case and files of "Arms and the Man" complete for 1920-1. Harry Brill, Mayo Building, Tulsa, Okla.

FOR SALE OR TRADE—Colt D. A. Revolver, .32-20, two barrels, interchangeable, 4 and 6 inches, two sets stocks, rubber and walnut. Cost $42.00; sell $25.00. Mauser rifle—Krupp—Essen—pre-war make, 8 m.m. Fine sporter. Please do not compare with present German junk. Cost $75.00—40 cartridges, $3.00. Sell all for $50.00. Will trade either for Colt Police Positive Target, .22 cal., or S. A. Colt Army, any caliber, if engraved and pearl or ivory stocks. Or fine remodeled Springfield, Winchester '95 Gov't., .30-'06, Remington Auto., .35 cal., or .22 Long Rifle, or Smith 16-gauge double, duck board. My guns are perfect inside and out and yours must be to trade. Dr. R. A. Brown, No. 7 South Howard Street, Akron, Ohio.

FOR SALE—7x7 Baker type special khaki canvas waterproof tent in bag of same material. In new condition. $15.00. A. D. Potter, 1119 McAllister Avenue, Syracuse, N. Y.

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FOR SALE—Ideal Bullet Lubricator with die for .30-06, $6.00; Ideal No. 10 Special Tool D. A. .30-06 and muzzle shell sizer, $4.00; Mould 308329, $1.50; Ideal No. 6 tool .32-40, S. A., $2.50; Mould 319247, $1.50. Winchester 1886 extra light .45-70 full magazine, new condiiton, $38.00. Savage N. R. A. 1919 .22 cal., $17.00. Savage Bolt .250-3000, $42.00. Send for list of used guns. Kirkwood Bros., Inc., No. 23 Elm Street, Boston, Mass.

MUST SELL—Ideal Reloading Outfit for .30-06, 800 Primers, 120, 180 grain Palma, and 300, 150 grain bullets. $10.00 takes lot. Colt's D. A. Revolver, cal. .45, Model '09, with holster and 375 cartridges. All in perfect condtiion. Price, $25.00. Winchester 5-A Scope and Knoble mount—A-1 condition, $24.00. Pre-war Springfield, perfect condition, inside and outside, meal parts blued. Price, $33.50. 1921 National Match Springfield. Excellent price, $29.00. Star-gauged Springfield, good condition. Price, $22.50. All rifles equipped with slings. '03 Rifle Stock, new; $3.00. British Micrometer, $3.00. 170 Rounds F. A. 15, Model '06, $3.00. 210 Rounds F. A. 21 Tin Can, $5.00. L. C. Mitchell, 504 W. Mulberry Avenue, San Antonio, Texas.

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FOR SALE OR TRADE—300-caliber Savage Combination Kit, new; has Lyman wind-gauge peep, bead front, extra checkering and recoil pad. Also one pre-war Luger, 8-inch barrel. WANT—Heavy Match Grade Springfield with Lyman No. 48 peep, and prism binoculars. C. F. Johnson, Delhi, Minn.

TRADE—Accurate 1906 Springfield Sporter equipped with 48 Lyman and gold bead sights, complete with set of spare parts consisting of firing pin, striker, extractor, magazine spring and cut-off, for Winchester '95 Carbine caliber .30-06 in gun crank condition. Dr. James D. Young, Onalaska, Wis.

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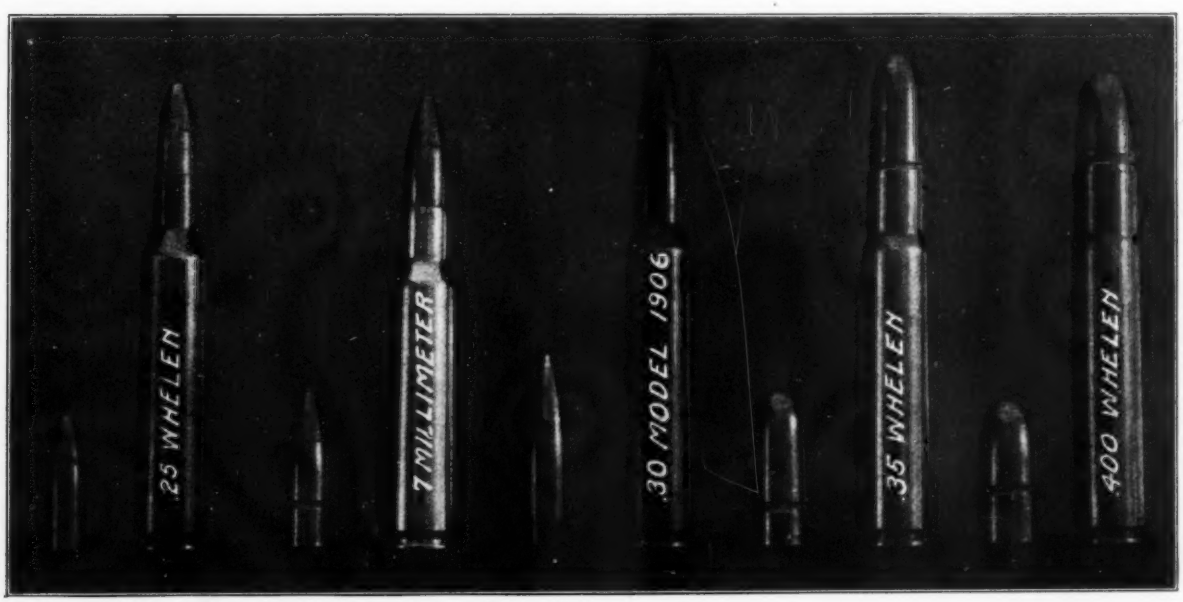

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25 Special H. P.	86	3300	2080	1.7″
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30 Model 1906	180	2725	2968	2.6
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